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Scientific paper sessions

Friday-September 19, 2008 - Lecture Hall 'A'

A1
10.50–12.05 - Intracranial Tumours I

A1:1:1

MRI QUALITATIVE EVALUATION OF SURGERY IN NEURO-ONCOLOGY: WHEN AND HOW ?

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OBJECTIVES
To present our MRI protocol for post surgical evaluation of residues after resection of brain tumors.
MATERIAL AND METHODS
Since 2004, 49 MRIs were performed for the post-surgical evaluation of brain tumors (8 grade II, 11 grade III, 23 grade IV of OMS classification, 1 ependymoma, 6 metastasis) with various sequences: FLAIR, T2WI gradient echo, 3D SPGR T1WI, post-contrast 3D SPGR T1 WI, substracted images between the 2 previous sequences. We compared pre- and postoperative MRIs and precised for each sequence its feasibility, quality, and diagnostic interest for residual tumor. We classified the post operative results into persistent residue, no remnant, doubt. The results were correlated with operative reports and histology.
RESULTS
MRI is performed within 3 days after surgery in order to properly differentiate tumoral residue from post-operative changes specially for high grade neoplasms where contrast enhancement is the most specific sign of tumor presence. Detection of this enhancement needs subtracted images between with and without contrast media sequences because of the spontaneous high signal depicted on T1WI due to the association of blood and hemostatic substance (as oxydized cellulose). T2 imaging is important to determine edematous changes beyond the edges of the resection, specially for low grade tumors.
CONCLUSIONS
Appropriate MRI protocols help to differentiate properly post surgical tumor remnants from operative changes. We will detail the interest of each sequence and will propose our optimal examination to answer the questions of oncologic quality of surgery and local hemorrhagic complications.

A1:1:2

CORRELATION OF MAGNETIC RESONANCE IMAGING MORPHOLOGIC ABNORMALITIES, MAGNETIC RESONANCE SPECTROSCOPY AND RADIATION TREATMENT DOSE-VOLUMES IN HISTOLOGICALLY PROVEN CEREBRAL RADIATION NECROSIS

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PURPOSE
The purpose of this study was to determine the location and characteristics of radiation injury abnormalities in the brain in relation MRS findings and to treatment radiation dose.
MATERIAL AND METHODS
Pre-surgical magnetic resonance imaging (MRI) of the brain of 11 patients (9 male, 2 female) previously treated with external beam radiation, dose range 60–81Gy for primary brain neoplasm and with post-surgical histologically proven cerebral radiation necrosis (CRN). The MRIs were evaluated for the location, extent and size of T2/FLAIR signal abnormalities, and abnormal enhancement. MRS was performed using 3D or 2D CSI (PRESS, TE/TR 144/2000 ms) and following ratios were calculated NAA/Cr, Cho/Cr, Cho/NAA, presence of lactate and/or lipids were noted. Different enhancement patterns including spreading wave front, swiss cheese/soap bubble or homogeneous enhancement, and central necrosis were described. The MRI and MRS findings were correlated to treatment radiation dose. Biologically corrected radiation dose plans (alpha/beta=2.5) Steele 2002 were co-registered to the pre-operative MRI using an in house functional imaging analysis tools. The CRN area was outlined as a volume of interest (rVOI) and percentage of the rVOI enclosed was determined as: central (>95% covered), in-field (>80–95%), marginal (20–80%), or distant (<20%).
RESULTS
In examined cases, the CRN volume was centrally located within the high dose region.
MRI demonstrated areas of contrast enhancement ranging from 1.76 to 25.9 cm with commonly spreading wave front or swiss cheese appearance with surrounding T2 and FLAIR abnomalities.

Based on changes in metabolic ratios with decrease in NAA and in most cases choline radiation necrosis was pre-surgically suggested.
CONCLUSIONS
Post-contrast enhanced tissue changes of CRN occurred entirely within the high dose region. Since the radiation treatment volume encompassed at least 1 to 2 centimeters around the initial enhancing tumor volume, these findings have important implications for our understanding of what tissues may be vulnerable to radiation injury.

A1:1:3

MRI(ADC) AND 99MTC-MIBI SPET RATIOS CORRELATE WITH HISTOLOGICAL GRADING OF GLIOMAS

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PURPOSE
The aim of the study was to compare pre-surgical apparent diffusion coefficient (ADC) values and 99 mTc-methoxyisobutylisonitrile (99 mTc-MIBI) uptake with histological findings in brain tumors.
MATERIAL AND METHODS
25 consecutive patients (16 males; mean-age 55 years, age-range 28 to 83 years) underwent SPET and MRI pre-surgical evaluation. MRI protocol included DP/T2, FLAIR, and pre- and post-contrast T1 weighted images. Diffusion weighted imaging (DWI) was also performed and apparent diffusion coefficient (ADC) maps were generated. ADC values of solid enhancing portions of the tumor and the contralateral normal appearing white matter were measured and a lesion-to-brain ratio (ADC ratio) was calculated. 99 mTc-MIBI SPET has been performed within 12 days from MRI. MIBI uptake was measured with a ROI drawn using as a reference post-contrast T1 images; a ratio of counts/pixel in the lesion to those in the contralateral region has been calculated. ADC and MIBI ratio were compared with histological findings.
RESULTS
Mean ADC value of the tumor was 1,17±0,30×10−3 mm2/sec. The mean ADC ratio for low-grade gliomas was 1,8×10−3 mm2/sec and 1,44×10−3 mm2/sec for high-grade gliomas. Mean MIBI ratio of the tumor was 24.1±34.8. Considering low grade gliomas MIBI ratio was 1.23±1.35 while for high grade gliomas it was 28.46±36.44. Histological findings revealed 4 low-grade (WHO 2–3) gliomas and 21 high-grade gliomas (WHO 4). There was a statistically (Wilcoxon rank sum test) significant difference in ratios between low grade (2–3 WHO) and high grade gliomas for both MRI ($p<0.05$) and SPET ($p<0.001$).
CONCLUSIONS
Proposed ADC and MIBI ratios seem to be correlated with histopathological grading of brain gliomas.

A1:1:4

IDENTIFICATION OF HYPERMETABOLIC REGIONS IN BRAIN GLIOMAS WITH T2′ MAPS

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INTRODUCTION
The purpose of our study was to assess the utility of T2′ maps in the evaluation of intracerebral gliomas. T2′ values reflect the presence of deoxyhemoglobin in brain tissue, related to a higher oxygen extraction. Therefore T2′ might be used to point out areas of high metabolic activity within the tumour.
MATERIALS AND METHODS
Preoperative MRI of 19 patients with brain gliomas (including low and high grade tumours - WHO II to IV) was performed according to our standard protocol. Additional T2 and T2* sequences with three echo times were added to the study. T2′ maps were calculated from T2 and T2* according to the formula: $1/T2' = 1/T2^* - 1/T2$. Perfusion MRI was performed in 9/19 patients with dynamic susceptibility technique. ROI analysis was applied to T2′ and rCBV maps. Also visual assessment was performed by 2 experienced neuroradiologists.
RESULTS
Three patients could not be further included in the study due to artifacts in T2′ maps, depending on tumour location (frontobasal, temporopolar). An inverse relationship was observed between rCBV and T2′ ($r=-0.348$, $p=0.019$) in the entire patient group. High grade (III-IV) gliomas showed significantly lower T2′ values compared to low grade (II) gliomas (mean 212 ms, SD 101 ms versus mean 352 ms, SD 139 ms, $p<0.000$). rCBV mean values were 0.91 (SD 0.36) for low grade tumours and 1.52 (SD 3.85) for high grade.
CONCLUSIONS
High grade tumours revealed lower T2′ values than low grade, presumably because of higher oxygen extraction as proliferating malignant tissues need more oxygen. This is in line with the hypothesis that T2′ values reflect the tumour metabolic activity. T2′ imaging represents a promising and non-invasive tool for assessment of brain gliomas that could help better targeting of biopsies, predict malignant transformation of low grade tumours and aid the surgeon in postoperative assessment.

A1:1:5

PROTON MR SPECTROSCOPY AS A TOOL FOR DISCRIMINATING BETWEEN TUMOUR AND PSEUDOTUMOURAL LESION IN SOLID BRAIN MASSES

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PURPOSE
Our aim was to assess the potential of single voxel proton MR spectroscopy (1H-MRS) as a tool to be used by neuroradiologists in the discrimination between solid tumours and pseudotumoural lesions of the brain.
METHODS
Eighty-four solid brain lesions were retrospectively retrieved for this study, including 68 glial WHO grade II and III tumours and 16 pseudotumoural lesions. Single voxel spectra at TEs of 30 and 136 ms were available in all cases. Cases were divided into two groups: "training set" (56 cases) and "test set" (28 cases). Differences between tumour and pseudotumour were assessed in the training set with the U Mann Whitney test. Two ratios between selected spectral points were defined as classifiers, one for each TE, on the basis of the results in the training set, and thresholds selected with ROC curves. The test set was retained until the classifiers were constructed and, then used to assess the reproducibility of the results.
RESULTS
Resonances that showed differences between tumour and pseudotumour ($P<0.05$) were MI at short TE, and NAA, GLX and CHO at long TE. The classifiers elaborated suggested tumour when MI/NAA>0.9 at short TE, and when CHO/NAA>1.9 at long TE. Accuracy of the classifiers in the test set at short and long TE was 82% and 79%, respectively. Both classifiers agreed into a single group in 21 cases. In 19 of such cases (19/21=90%) the suggested diagnosis was correct.
CONCLUSIONS
Tumours and pseudotumours show significant differences at both short and long TE spectra. These differences can be used to classify brain masses as tumour or pseudotumor. Our results suggest a role for spectroscopy in the clinical management of brain masses.

A1:1:6

MAPPING OF MOTOR AREAS IN BRAIN TUMOUR PATIENTS: NAVIGATED BRAIN STIMULATION (NBS) AND FMRI

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Navigated Brain Stimulation (NBS) potentially permits non-invasive mapping of eloquent cortex by direct activation of corticospinal tracts. NBS combines transcranial magnetic stimulation with accurate guidance by individual structural 3DT1-weighted MRI. Functional magnetic resonance imaging (fMRI) is an established clinical tool for mapping of motor areas.
METHODS
Motor cortices of five patients (three malignant glioma, one oligodendroglioma gradeII-III, one cavernoma) were bilaterally mapped with NBS and fMRI.
A single magnetic pulse was delivered with a figure-of-eight 70 mm coil. During NBS, electromyography was monitored on-line. Optimal representation sites to thenar muscles were localized in primary motor cortex (M1), and motor threshold (MT) was determined. M1 and premotor area were mapped at 110%MT by recording motor evoked potentials (MEPs) of discrete hand and face muscles.
fMRI was performed as block designed study. The threshold of z-value was individually tightened so that only the most significant activation remained.
RESULTS
In four patients MT was lower in the lesional hemisphere (40.0± 4.9%) than in the non-lesional (42.6±6.3%). Primary motor areas were found in all hemispheres and showed classical soma-totopic order. In four cases the stimulation on the margin of tumour or surrounding oedema also elicited muscle responses.
The optimal stimulation site for thenar and the most significant activation in fMRI were seen in the same gyrus or adjoining sulcus in 7/9 hemispheres. In one non-lesional hemisphere, NBS lo-calized optimal motor representation in postcentral gyrus, whereas fMRI activation was more anterior in central sulcus. In one case the fMRI threshold was non-adjustable; in lesional hemisphere NBS was identical to fMRI, in non-lesional hemisphere NBS site was on M1 but fMRI activation was in superior postcentral sulcus.
CONCLUSIONS
NBS is a sensitive tool for preoperative mapping; provides a useful method for examination of the area surrounding the tumour, and function of corticospinal tracts. NBS information added with fMRI is clinically valuable for the operating neurosurgeon.

A1:1:7

MULTICENTER DOUBLE-BLIND RANDOMIZED INTRAINDIVIDUAL CROSSOVER COMPARISON OF GADOBENATE DIMEGLUMINE AND GADOPENTETATE DIMEGLUMINE IN MRI OF THE CNS AT 3 TESLA

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PURPOSE
To prospectively compare 0.1 mmol/kg doses of gadobenate dimeglumine and gadopentetate dimeglumine for contrast-enhanced MR imaging (MRI) of brain lesions at 3 Tesla (3T) using a multicenter, double-blind, randomized, intra-individual crossover protocol.
METHODS AND MATERIALS
Forty-six patients underwent two 3T MRI examinations separated by >2 but <7 days. Gadobenate dimeglumine was administered as the first agent to 23 patients (group A) while the order of administration was reversed for the remaining 23 patients (group B). Contrast administration, imaging parameters (pre- and post-dose T1w spin-echo and gradient-echo sequences), and the interval between injection and image acquisition were identical for the two examinations in each patient. Images were evaluated off-site by three independent, fully

blinded experienced neuroradiologists using qualitative interpretation criteria (lesion border delineation, lesion contrast enhancement) and quantitative enhancement parameters (lesion-to-brain ratio [LBR], contrast-to-noise ratio [CNR], % lesion enhancement). Overall diagnostic preference was assessed in terms of lesion conspicuity, detection, and diagnostic confidence. Between-group comparisons were performed using Wilcoxon signed-rank test. Reader agreement was determined with kappa (ê) statistics.
RESULTS
There were no significant ($p>0.05$) demographic differences between groups (group A: 12 men, 50.8±15.5 years; group B: 9 men, 48.1± 16.1 years). Readers 1, 2 and 3 expressed diagnostic preference for gadobenate dimeglumine for 22 (53.7%), 21 (51.2%) and 27 (65.9%) patients, respectively, compared with 0, 1 and 0 patients for gadopentetate dimeglumine. Similar significant ($p<0.001$) preference was expressed for determinations of lesion border delineation and contrast enhancement. Reader agreement was high (ê=0.48−0.64) for each qualitative endpoint. Significantly ($p<0.05$) higher LBR (+43.5%−61.2%), CNR (+51.3%−147.6%) and % lesion enhancement (+45.9%−49.5%) was noted with gadobenate dimeglumine by each reader.
CONCLUSIONS
Depiction of brain lesions at 3T is significantly improved with 0.1 mmol/kg gadobenate dimeglumine compared with gadopentetate dimeglumine at equivalent dose.

A1:1:8

QUANTITATIVE ASSESSMENT OF BRAIN TUMOR VASCULARITY: CORRELATION OF NON-CONTRAST HIGH-RESOLUTION SUSCEPTIBILITY-WEIGHTED IMAGE WITH MR PERFUSION IMAGING AT 3T

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PURPOSE
To correlate the degree and the pattern of susceptibility signals using high-resolution high-field (3T) SWI with the values of MR perfusion parameters and histopathology in intra-axial tumors.
METHODS AND MATERIALS
27 patients with 33 intra-axial tumors, scheduled for total tumor resection, underwent both non-contrast high-resolution SWI and MR perfusion imaging at 3T. The degree and the pattern of susceptibility signal in the tumor region was blindly assessed by two radiologists and correlated with the quantitative values of MR perfusion parameters (normalized cerebral blood volume (nCBV) and normalized permeability value). Receiver operating characteristic (ROC) curve analyses were performed to determine optimum thresholds and diagnostic accuracy for determining high grade tumor. Intraclass correlation coefficient (ICC) was used to determine the levels of interobserver variability in quantitative analysis of SWI and MR perfusion imaging.
RESULTS
Inter-observer agreements for both the degree and the pattern of susceptibility signals and MR perfusion parameters were excellent (ICC=0. 84− 0.97). Correlation between the degree of susceptibility signals and the value of MR perfusion parameters was statistically significant (vs CBV, 0.65; $P=0.003$, vs Permeability, 0.72; $P<0.001$). In the ROC curve analysis with histopathologic correlation, the optimal sensitivity, specificity, positive predictive value, and negative predictive value for determining a high grade tumor by using the degree of susceptibility signals were 78.7, 98, 100, and 63%, respectively.
CONCLUSIONS
The quantitative assessment of brain tumor vascularity with using non-contrast high resolution high-field SWI was feasible but larger population studies are required for the clinical application.

A2
12.10–13.30 - Advanced MR Techniques I

A2:2:1

COMPARISON OF GENERAL LINEAR MODEL (GLM) VERSUS MULTI SESSION TENSOR INDEPENDENT COMPONENT ANALYSIS (TICA) APPROACH TO FMRI ANALYSIS OF EMOTIONAL PROCESSING IN MALES AND FEMALES

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PURPOSE
Based on our own data, concerning emotional processing in males and females, we show strengths and weaknesses of two methods of fMRI analysis, namely classical GLM approach, based on a priori hypothesis regarding time course of activations and novel assumption free, data driven analysis method, TICA.
METHODS
40 volunteers, 21 women and 19 men were examined in the Signa 1.5T MR system (BOLD). Each experimental session consisted of five activation periods, three of which constituted baseline and two experimental condition. In the experimental condition subjects were shown slides selected on the basis of high score on Arousal and Valence scales from standardized IAPS picture set. In the baseline condition custom prepared color checkerboards were presented. There were two experimental runs, in the first run subjects saw only negatively-valenced pictures (negative condition), while in the second run only positive pictures were shown (positive condition). Functional images were acquired using a spin-echo echoplanar sequence. Image data were analyzed using both classical GLM approach implemented in FEAT (fMRI Expert Analysis Tool) and assumption free, data driven analysis method, MELODIC (Multivariate Exploratory Linear Optimized Decomposition into Independent Components) Version 3.0, both tools being part of FSL 4.0 statistical package (Analysis Group, FMRIB, Oxford, UK).
RESULTS
We show that TICA yields more detailed picture of activations pattern, both in temporal and spatial domains. This provides

researcher with lot of insight into his results. GLM in contrast, tends to block different effects into one large spatial map of significant activations, making fine interpretation of results extremely difficult.
CONCLUSIONS
Comparing the results obtained using GLM and TICA we point to potential advantages of TICA over classical GLM. Especially we show how TICA can help in resolving ambiguity and uncertainty inherent for the GLM approach.

A2:2:2

OPTIMIZATION OF CLINICAL FUNCTIONAL MRI PROTOCOLS AT 3 TESLA

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INTRODUCTION
Functional MRI methods are integral steps of pre-surgical workup nowadays, but the protocols applied differ across imaging centers. Moreover, the majority of paradigms have been validated on 1.5T, while the better signal-to-noise ratio and the higher spatio-temporal resolution of higher field scanners can yield different maps for similar paradigms.
PURPOSE
To evaluate a set of paradigms for mapping language production and comprehension, motor cortex, and hippocampus while defining optimal acquisition parameters, as well.
METHODS
We performed functional MRI on 10 healthy volunteers in a block designed manner using picture naming, grammatical decision, auditory comprehension, auditory grammatical decision, cued motor response, and spatial memory paradigms. A parametric evaluation of statistical significance versus paradigm length followed, by modifying the number of paradigm blocks involved in processing in order to find the shortest paradigm length providing solid results. Moreover, we compared the configuration of functional activations yielded by the four different language mapping paradigms. Finally, we did a comparison of our maps with those described in the literature both at 1.5T and 3T.
RESULTS
All of the investigated language, motor and memory mapping paradigms provided solid and consistent activation maps comparable with the literature. The auditory grammatical decision paradigm was capable of mapping language production and comprehension networks in one step. The activation maps were in general bigger than those described at 1.5 Tesla at the same significance. The configuration of language-related activation maps differed across paradigms, so as the optimal length of a given examination.
CONCLUSIONS
It is possible to map language production and comprehension in one step. All investigated paradigms can provide consistent maps but the different configuration found at 3T compared with literature results on 1.5T must be taken into account during evaluation. The compatibility of results obtained on 1.5 and 3 T should be further investigated.

A2:2:3

PLASTIC CHANGES IN THE FUNCTIONAL BRAIN ORGANISATION INDUCED BY FORCED RIGHT-HANDEDNESS - FMRI STUDY

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The aim of the study was to determine if the brain activity pattern for motor functions in individuals switched from left to right hand differs from that of right-handers (RH) and left-handers (LH), and whether differences in activity patterns between groups depend on the complexity of motor behaviour and the hand (preferred vs. non-preferred) performing the task.
Fifty-two subjects were divided into 4 groups: consistent RH, consistent LH and two groups of switched subjects. The two latter groups use their right hand for writing, but differ as to the hand preference profile. Subjects performed two tasks with either hand: simple movements (flexion-extension of an index finger) and complex movements (sequential thumb-to-finger opposition tapping). The results showed that in RH there was a predominance of the left-hemisphere activation. In LH this pattern was reversed, toward to the right hemisphere domination. The switched groups showed no such volumetric asymmetry. Increasing levels of complexity of motor activity resulted in an increase in the volume of activated areas and involvement of ipsilateral activations. In both RH and LH, movements of the preferred hand activated mainly the contralateral hemisphere, whereas movements of the non-preferred hand resulted in a more balanced pattern of activation in two hemispheres, indicating higher involvement of the ipsilateral side. This suggests that in RH and LH the preferred hand is controlled mainly by the dominant hemisphere, whereas the non-preferred hand is controlled by both hemispheres. In the two switched groups a relatively smaller amount of ipsilateral control by either hemisphere was found. Generally, they shared features of both RH and LH as regards their brain motor control architecture and hand preference quotients. Moreover, in switched subjects the profile of handedness corresponds with pattern of ipsilateral activation asymmetry. It suggests that ipsilateral aspect of motor control is critical for hand motor domination.

A2:2:4

HOW DIFFERENT BRAIN PATHOLOGIES INFLUENCE LANGUAGE PLASTICITY IN THE BRAIN: FMRI STUDY

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PURPOSE
An atypical inter-hemispherical organization of cortical language areas was demonstrated using PET and fMRI in several pathological conditions affecting the brain: tumors, epilepsy and stroke. The aim of this study was to evaluate the correlation between different neurological diseases and language re-organization/plasticity.
METHODS
We enrolled 89 consecutive right-handed neurosurgical patients: 25 with refractory epilepsy, 51 with brain gliomas, 13 with brain cavernoma and an age-matched group of 14 right-handed healthy controls. All patients underwent fMRI while performing word and verb generation tasks. The number of active voxels for the right and left hemispheres and laterality indices [LI = (L-R)/(L+R)] were calculated. Differences in lateralization were evaluated between tumour, epilepsy, cavernoma and control groups. Differences in lateralization were correlated with the hemispherical distribution (left or right), histopathology, size and site of the lesion.
RESULTS
Language was significantly less lateralized to the dominant (left) hemisphere in patients with epilepsy and left hemisphere tumor, compared to controls. Whereas, differences were not observed in cavernoma and right hemisphere tumor. Cavernoma influenced lateralization only when in the left hemisphere and close to language structures. In brain tumors, language re-organization directly correlated with malignancy, large volume and close spatial relationship ($p<0.019$, $p<0.0061$, and $p<0.02$, respectively).
CONCLUSIONS
Size, side, position and type of pathology independently or in a combined manner influenced language plasticity. Left hemisphere gliomas altered lateralization of language (side effect); epilepsy altered lateralization independently of which hemisphere was affected (disease effect). Cavernoma induced language reorganization only when in close relationship with functional areas (local effect).

A2:2:5

FMRI IN LOCALIZATION OF LANGUAGE AREAS IN BILINGUALS

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AIM
The of aim of the present study was the estimation of localization differences during speech production in native (L1) and foreign (L2) language, and the influence of age of acquisition and proficiency level on activation patterns of language areas.
MATERIAL
64 volunteers with different age of acquisition and proficiency level of the foreign language participated in the experiment.
METHOD
Block design method, with sentence production as the experimental tusk, and silence as the control tusk, was used with 1.5T MR system. Data analysis was performed by SPM2.
RESULTS
It was demonstrated that speech production in L1 and L2 activated similar cortical areas. In the global results there was a more extensive activation of the left inferior frontal gyrus in L2. In the high proficiency groups, there was a stronger activation in the left inferior and middle frontal gyrus in L2. The low proficiency groups showed differentiated patterns of cortical activation.
CONCLUSIONS
In the present work it was shown that similar cortical areas were active during speech production in the native and the foreign language, while differences in the foreign language included stronger activation of the left inferior frontal gyrus in L2, which is involved in phonological processing and plays a role in working memory. Both age of acquisition and proficiency level of the second language influences the pattern of activation of language areas.

A2:2:6

FUNCTIONAL MAGNETIC RESONANCE IMAGING OF THE GENDER DIFFERENCES IN ACTIVATION OF THE BRAIN EMOTIONAL CENTRES

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The main aim of this study was revealing the gender differences in the localization of the brain emotional centres for the positive and negative stimuli.
MATERIAL AND METHODS
Forty right-handed young volunteers (age range 18–36 years), 21 men and 19 women were examined using the MR 1,5 T Signa Horizon (GEMS). Functional images were acquired using a spin-echo echoplanar sequence sensitive to blood oxygenation level dependent (BOLD) contrast, with following parameters: TR=3000 ms, TE=60 ms, FOV=28×21 cm, matrix 96×96,1 NEX.
For emotion induction affectivly negative, positive and neutral pictures were used.
Positive and negative cues were taken from the International Affecive Picture System (IAPS).
There were two runs, in the first run subjects saw only negatively valenced pictures, during the second run only positive pictures were shown.
RESULTS
For the positive stimuli the greatest differences in activation in woman compared to men we detected in the right superior temporal gyrus.
For the negative stimuli the greatest differences in activation in woman compared to men we detected in the left thalamus.
For the positive stimuli the greatest differences in activation in man compared to woman we detected in bilateral occipital lobes as well as bilateral fusiform gyrus.
For the negative stimuli the greatest differences in activation in man compared to woman we detected in left insula.
CONCLUSIONS
There are statistically significant differences in activation of the emotional centers between females and males for the positive and

negative stimuli. Using fMRI we revealed gender differences in the localization of the brain emotional centres in the passive perception paradigm.

A2:2:7

THE FIRST CASE OF NEUROSURGICAL TREATMENT OF EPILEPSY ON THE BASIS OF IMAGE FUSION OF MRI AND SPECT

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PURPOSE
To present the first neurosurgical operation based on results of MRI and SPECT fusion in a case of drug-resistant epilepsy in a child.
MATERIAL AND METHODS
Brain MRI and interictal SPECT with 99 mTcECD were performed in a 7-year-old boy with cortical dysplasia-related epilepsy. He had history of three previous neurosurgical procedures and recurrence of seizures. MRI was performed with a 1,5 T unit. Volumetric 3D/SPGR/T1WI were obtained in addition to standard procedure. SPECT was analyzed visually and semiquantitatively (Neurogam software) by comparison to normal database. PMOD software was used as a tool of image fusion and postprocessing. The VOI constructor program coupled with PMOD allowed to calculate the volume and number of counts in each region with interictal hypoperfusion. The results of integrated neuroimaging were compared to clinical and EEG findings.
RESULTS
Corregistration of interictal SPECT and MRI with comparison of left and right analogous structures' activity (counts per mm3) allowed to evaluate the suspected epileptogenic foci. Image fusion was necessary for precise localization of functional changes on anatomical images. The hypoperfused regions were localized in the right fronto-parieto-occipital junction, medial part of the right temporal lobe and in the right parietal lobe. Taking into account the results of EEG, the remainings of right frontal and parietal lobe close to occipital lobe were surgically removed. No seizures have been observed since then (for seven months now).
CONCLUSIONS
In children with drug-resistant epilepsy image fusion of MRI and SPECT has high clinical utility in localizing epileptogenic focus before neurosurgical treatment.

Friday - September 19, 2008 - Lecture Hall 'B'

B1
10.50–12.05 - Cerebrovascular Disease I

B1:1:1

CT ANGIOGRAPHY COVERING BOTH CERVICAL AND CEREBRAL ARTERIES ON A 16-DETECTOR ROW SYSTEM: MODIFICATION OF CONTRAST DOSE AND INJECTION RATE BY PATIENT WEIGHT

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PURPOSE
Our previous study showed CT angiography using 75 mL of contrast agent of 350 mgI/mL can well visualize cervical and cerebral arteries on a 16-detector row system. We assessed the feasibility of modification of the dose and injection rate by patient weight.
METHODS
We examined 60 patients using contrast agent of 350 mgI/mL in combination with a saline flush (40 mL). They were assigned to one of four groups: group A: injection dose (ID) of 1.3 mgI/kg; group B: ID of 1.1 mgI/kg; group C: ID of 0.9 mgI/kg; and group D of 75 mL at 3 mL/s (25 sec). In groups A to C, the injection time was fixed at 20 sec. We measured the attenuation of the common carotid artery (CCA), internal jugular vein, proximal middle cerebral artery (MCA), basilar artery (BA), and straight sinus. Additionally, two readers visually assessed the demonstration of the carotid bifurcation and the circle of Willis.
RESULTS
The average dose and rate were 81.3/4.1 (mL/mL/sec), 63.8/3.2, and 49.4/2.5 for group A, B, and C, respectively. The doses of groups B and C were significantly smaller that that of group D. In cerebral vessels, there was no significant attenuation difference between group D and groups A and B, but the attenuation of MCA and BA was significantly lower in group C than that of group D. In cervical arteries, the attenuation of CCA in group C was significantly lower than that of groups A and B, while no difference was present between that of group C and group D. In visual assessment, no difference was found among the four groups.
CONCLUSIONS
Cervical and cerebral CT angiograms can be obtained at a dose of 1.1 mgI/kg, which can effectively reduce the contrast dose.

B1:1:2

CT ANGIOGRAPHY COVERING BOTH CERVICAL AND CEREBRAL ARTERIES USING A REDUCED DOSE AND HIGHER CONCENTRATION ON A 16-DETECTOR ROW SYSTEM: EFFECT OF A HIGHER IODINE DELIVERY RATE AND A SALINE FLUSH

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PURPOSE
Our previous study showed the feasibility of CT angiography (CTA) using a reduced dose (75 mL) and higher concentration (350 mgI/mL) of contrast on a 16-detector row system to visualize both cervical and cerebral arteries. We assessed the effect of an iodine delivery rate (IDR) and a saline flush in this protocol.
METHODS
Forty-five consecutive patients were assigned to one of three groups: group A: injection speed (IS) of 3.0 mL/s and IDR of 1050 mgI/s; group B: IS of 2.3 mL/s and IDR of 805 mgI/s; and group C: IS of 2.3 mL/s and IDR of 805 mgI/s with a saline flush of 40 mL. On source images, we measured the attenuation of the common carotid artery, internal jugular vein, proximal middle cerebral artery, basilar artery, and straight sinus. Additionally, two readers visually evaluated the demonstration of the carotid bifurcation and arteries of the circle of Willis using a three-point grading scale.
RESULTS
In both cervical and cerebral arteries, the attenuation of group A was significantly higher than that of group B. In other regions, there were no significant differences among the three groups. Although no significant difference was noted on the visual assessment, demonstration of intracranial arteries was rather insufficient in some patients in group B.
CONCLUSIONS
A higher IDR is effective to improve the demonstration of both cervical and cerebral arteries, but it does not affect that of the venous system. The saline flush can reduce IS without decrease in the attenuation of vessels.

B1:1:3

320-MULTIDECTOR CT IN THE EVALUATION OF ARTERIAL CEREBROVASCULAR DISORDERS

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BACKGROUND
small z-axis coverage of current multidetector CT (MDCT) limits the role of CT in the study of cerebrovascular disease. With its 16-cm z-axis coverage in one gantry rotation, 320-MDCT now offers the possibility of simultaneously obtaining whole-brain CT perfusion (CTP) and dynamic subtracted whole-head angiography by sequential scanning during the passage of the contrast bolus.
METHODS
44 adult or pediatric patients with various cerebrovascular conditions, including acute thromboembolic stroke, dissection,and acute intra- and extracranial steno-occlusive disease were scanned on the 320MDCT (Acquilion 1, Toshiba, Japan). Sequential whole-head volumes were obtained at variable intervals after infusion of 50 ml of iopamidol 370 at a rate of 6 ml/s using low-dose parameters (80 kV, 100 mA). Subtraction as well as three- and four-dimensional reconstructions were performed on a dedicated workstation (Toshiba, Japan). CTP was processed on a separate workstation (Vitrea, Vital Images, USA). In 11 patients, standard CTA of the supra-aortic trunks was performed as well.
RESULTS
In all cases, excellent anatomical information was obtained identifying stenosis, aneurysms, collateral pathways in Moya-Moya,and arterial feeders in AV shunts. Subtraction offered reliable evaluation of stenoses in the petrous and cavernous internal carotid arteries and intracranial segments of the vertebral artery. Dynamic 4DSCTA images were of excellent temporal resolution, producing true arterial and venous phases, and allowing for detection of circulatory delay due to stenotic disease. Finally, whole-brain CTP was particularly useful in evaluating acute stroke and patients with severe stenotic disease before and after therapy, and correlated with Dynamic 4D SCTA findings.
CONCLUSIONS
320-MDCT offers unprecedented z-axis coverage allowing for whole brain CTP and dynamic subtracted CTA that may consolidate the role of MDCT as a first intention imaging technique for selected cerebrovascular disorders, in particular for the acute management of stroke.

B1:1:4

DYNAMIC SUBTRACTED VENOGRAPHY WITH 320-MULTIDECTOR CT

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BACKGROUND
With its 16-cm z-axis coverage in one gantry rotation, 320-multidetector CT (320MDCT) offers the possibility of simultaneously obtaining whole-brain perfusion (CTP) and dynamic whole-head subtracted angiography by sequential head scanning during the passage of the contrast bolus.
METHODS
44 adult or pediatric patients with various cerebrovascular conditions, including intracranial venous thrombotic and steno-occlusive disease as well as developmental venous anomalies, were scanned on the 320MDCT (Acquilion 1, Toshiba, Japan). Sequential whole-head volumes were obtained at variable scanning intervals tailored to individual pathology after infusion of 50 ml of iopamidol 370 at a rate of 6 ml/s, using low-dose parameters (80 kV, 100 mA). Three- and four-dimensional reconstructions were performed on a dedicated workstation (Toshiba, Japan). Segmentation of the venous system after removal of the arterial phase was performed in each case. CTP was processed on a separate workstation (Vitrea, Vital Images, USA).
RESULTS
Subtracted whole-head CT venography provided in all patients a dynamic appreciation of the intracranial circulation, discriminating the arterial and venous phases with excellent temporal resolution. This capacity was found to be particularly useful in the evaluation of patients with venous steno-occlusive disorders including pseudotumor cerebri, and with complex venous malformations, where an AV-shunt needed to be ruled out. Excellent subtraction of bone and calcifications overcame the limitations related to partial volume averaging in the study of cortical veins, dural venous sinuses, and diploic veins. Segmentation of the venous system improved the quality of the images by the exclusion of all arterial structures. CTP acquired simultaneously was useful in demonstrating associated perfusion abnormalities, in particular in cases of venous thrombosis.
CONCLUSIONS
Dynamic subtracted whole-head CT venography obtained with 320-MDCT produces excellent anatomical and dynamic imaging of the cranial venous system, and appears to be a powerful new tool for the evaluation of intracranial venous disorders.

B1:1:5

EVALUATION OF 3D PSEUDO-CONTINUOUS ARTERIAL SPIN LABELING (ASL) IN THE ASSESSMENT OF CEREBROVASCULAR RESERVE CAPACITY IN SYMPTOMATIC PATIENTS WITH ARTERIAL STENOSIS

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PURPOSE
To evaluate 3D pseudo-continuous Arterial Spin Labeling (3D pcASL) MRI sequence to assess cerebrovascular reserve capacity, in patients with high grade arterial stenosis and ischemic symptoms.
METHODS
CBF (Cerebral Blood Flow) was measured using 3D pcASL in 16 patients (17 examinations were performed) with major intra-cranial arteries stenosis (4 intracranial ICA and 9 MCA stenosis) or cervical carotid artery stenosis (3 patients), with ischemic symptoms (3 transient ischemic strokes, 12 ischemic strokes, 1 hemorrhage stroke), both baseline and 20 minutes after intravenous administration of 1 g of acetazolamide, on a GEMS 1.5 T scanner. We compared to DSC perfusion sequence with gadolinium injection.
RESULTS
Interpretable CBF maps were obtained in 33 cases from 34, in 16 patients (age 64.5 +/-13 years, 14 males). CBF asymmetry between unaffected and affected hemispheres was found in 12 patients: above 20% in 8 patients, and from 10 to 20% in 4 patients. After acetazolamide challenge, the asymmetry was increased in 3 patients.3 patients showed a stable asymmetry and 6 patients showed a decreased asymmetry, testifying persistent cerebrovascular reserve capacity. Patients who had no asymmetry baseline (4) showed no asymmetry after acetazolamide challenge. We found good correlation with DSC perfusion findings.
CONCLUSIONS
The evaluation of cerebrovascular reserve capacity using 3D pcASL is feasible. 3D pcASL allows absolute CBF quantification, without post-processing induced variability. Vascular patterns (hemodynamic significance of the stenosis) can be distinguished to help making the treatment decision. Quantification algorithm gives consistant values, reproductible but likely underestimated.

B1:1:6

TRANSCRANIAL DOPPLER AIDED DETECTION OF MICROEMBOLI DURING INTERNAL CAROTID ARTERY STENTING

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Minimalization of microembolic complications is an important aspect of carotid artery stenting (CAS). Manipulation performed during different phases of CAS influences the extent of embolisation. We examined the degree of microembolisation during different phases of CAS by means of transcranial doppler (TCD).
SUBJECTS AND METHODS
150 patients were monitored with TCD during CAS procedure. 98 male and 52 female patients were included in our study, mean age was 64 years. Predilatation was needed in 13 cases and postdilatation was done in 139 cases. We divided the CAS procedure in seven phases, and by using TCD we counted microemolic signals (MES) in every phase. 6 commercially available dedicated endovascular devices were used.
RESULTS
Intraprocedural embolisation was detected in every phase of CAS, although the extent of embolisation showed severe variation. We detected 12925 microembolic signals. Average number of emboli detected during stent deployment (38,7 MES) and balloon dilatation (26 MES) were significantly higher than the number of emboli detected during stent positioning (8,6 MES) and the rest of the procedure. 5 Symbiot (Boston Scientific) covered stents were implanted, intraprocedural embolisation was measured and we discovered that during these procedures the rate of embolisation was lower by 52,5%.
CONCLUSIONS
Our results showed that distal embolisation could be discovered in any phase of CAS procedure, but the extent varies significantly between phases. Possible omission of steps involving high embolisation rate (pre- and post-dilatation) could significantly reduce the risk of embolisation. Results with covered stents, seems to be a promising solution for lowering the embolisation rate. The use of TCD informs the operator of the actual extent of embolisation in real time and urges a more cautious device manipulation, moreover can be used as an aid during learning CAS procedure.

B1:1:7

A NEW CT-BASED CLASSIFICATION OF SPONTANEOUS SUPRATENTORIAL INTRACEREBRAL HAEMATOMAS

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BACKGROUND
In patients with intracerebral haematoma (ICH) secondary to the rupture of aneurysm or arteriovenous malformation (AVM) conservative therapy and follow-up without angiographic evaluation is associated with a risk of recurrent bleeding. It is necessary for a clinician to identify a subgroup of patients with spontaneous supratentorial ICH who are likely to harbour high-flow vascular malformations that require specific treatment - neurosurgical or neuroradiological. A new CT-based classification for supratentorial ICH aimed at a close correlation between ICH localization and occurrence of high-flow vascular malformations diagnosed on angiography is presented.
MATERIAL AND METHODS
According to the proposed classification supratentorial ICH are divided into deep and cortico-subcortical. The deep group is further subdivided into striatocapsular, lobar ICH and isolated intraventricular haemorrhage and the cortico-subcortical group into paracisternal and convexity ICH. A new classification was used in a consecutive

series of 108 patients with spontaneous supratentorial ICH subjected to angiographic evaluation.
RESULTS
Deep ICH in non-hypertensive patients was secondary to AVM rupture in 57.1% (8/14). High-flow vascular malformation was a source of bleeding in 93.6% of patients with paracisternal ICH - aneurysm in most cases (41/47). Convexity ICH was found to be AVM-related in 35.7% of patients (5/14).
CONCLUSIONS
Our clinical experiences show the proposed classification appears to be closely associated with angiographic findings. Its clinical application with consideration of other factors like age and arterial hypertension may help clinicians to identify high-risk ICH patients for angiographic evaluation and further specific treatment to prevent rebleeding.

Keywords:
Intracerebral haemorrhage
ICH classification
Cerebral angiography
vascular malformations

B1:1:8

T2 VALUES CORRELATE WITH TIME FROM SYMPTOM ONSET IN ACUTE STROKE

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PURPOSE
Reliable assessment of time from symptom onset is crucial in acute stroke since thrombolytic therapy is usually initiated within three hours. We hypothesize that in comparison to diffusion-weighted imaging (DWI), T2 values are more directly related to water uptake in ischemic tissue. We measured T2 relaxation times in the infarct core to quantify the correlation between time from symptom onset and change in T2 values.
METHODS
Thirty-six patients with acute ischemic stroke in the territory of the proximal middle cerebral artery (MCA) underwent MR imaging including DWI, fluid-attenuated inversion recovery (FLAIR) and a triple echo T2 sequence (and calculation of T2 maps) within 6 hours after symptom onset. Regions of decreased apparent diffusion coefficient (ADC) below a threshold of $550\times10\text{^}{-9}$ mm^2/s were defined and superimposed onto the corresponding T2 map.. Differences of T2 and ADC values between affected and unaffected side were calculated (difqT2 and difADC) and corresponding FLAIR images were rated for lesion visibility.
RESULTS
DifqT2 values showed a significant correlation with time from symptom onset ($R=0.545$; $p=0.001$), whereas difADC values in the thresholded area were not time dependent ($R=0.301$; $p=0.074$). DifqT2 values measured in patients with visible FLAIR lesions were significantly higher than in those without visible hyperintensity in FLAIR ($p=0.001$). The accuracy of qT2 to predict a time from symptom onset <3 hours was 0.79 while the corresponding accuracy for visual assessment of FLAIR images was 0.61.
CONCLUSIONS
While ADC values in the infarct core did not show time dependent changes <6 hours, qT2 values demonstrated a strong correlation with time from onset suggesting different pathophysiologic mechanisms. T2 values quantitatively predict actual time from symptom onset, whereas FLAIR only provides binary information on lesion visibility. In addition T2 values are free from operator bias and can therefore increase reproducibility to determine time from symptom onset.

B2
12.10–13.30 - Interventional Neuroradiology: Brain I

B2:2:1

TREATMENT OF INTRACRANIAL SACCULAR ANEURYSMS USING HIGH MESH DENSITY VASCULAR ENDOPROSTHESIS (PIPELINE™): THE BUDAPEST EXPERIENCE

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BACKGROUND AND PURPOSE
The purpose of this study was to test the safety and efficacy of a novel vascular endoprosthesis, the Pipeline™ Embolization Device (PED). This vascular reconstruction system was designed to provide stable occlusion, with or without adjunctive coils.
METHODS AND MATERIALS
A total of 18 aneurysms were treated in 17 patients as part of a safety trial. All aneurysms were located on the internal carotid artery: 1 on cavernous segment, an 16 on the supraclinoid portion. Four aneurysms were giant, 10 were large and 4 small. The Pipeline™ device is a flexible, radiographically visible, high mesh density metallic vascular endoprosthesis that can be delivered through 3F regular microcatheters. If necessary, coils were placed within the aneurysm following endoprosthesis placement.
RESULTS
All 18 aneurysms were treated successfully. One patient had multiple seizures within the first 3 days following the procedure that was thought to be related to contrast agent hyperreaction, one had a retinal branch occlusion of the ophthalmic artery, one patient had a temporary parent artery occlusion that has recanalized, and one patient died from ruture of another aneurysm. A single PED was used in 8 cases, 2 overlapping devices in 6, 3 in 2, and 4 in another case. Significant reduction of intraaneurysmal flow was recorded in all cases with complete stasis seen in 5. Additional coil treatment was performed in 6 cases without tight packing. Immediately, complete aneurysm occlusion was achieved in 4, and subtotal occlusion in 14 cases. Six months angiographic follow up was

performed in 11 cases so far, demonstrating complete occlusion of all aneurysms.
CONCLUSIONS
In this small series, the novel vascular reconstruction system proved to be safe and highly effective in either providing or supporting occlusion of otherwise difficult to treat aneurysms by effectively reducing intraaneurysmal flow.

B2:2:2

A SYSTEMATIC REVIEW OF COATED COILS USED IN ENDOVASCULAR ANEURYSM TREATMENT: PRELIMINARY RESULTS

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PURPOSE
To present the preliminary results of an ongoing systematic review into the utility of coated coil technologies in the endovascular treatment of intracranial aneurysms. Presented on behalf of ICONE
MATERIALS & METHODS
A systematic review of the English language literature was performed to the end of December 2007. This utilised a detailed search strategy of MEDLINE and EMNBASE databases supplemented by hand searching of AJNR, Neuroradiology, Stroke, Journal of Neurosurgery. A structured assessment of studies that met identified criteria was then performed to extract data and give an objective score of study quality against pre-defined criteria. An objective quality score of >40% was required for inclusion. The systematic review was undertaken by interventional neuroradiologists experienced in undertaking systematic reviews.
RESULTS
A total of 219 references were identified. After elimination of studies of <10 subjects, studies not published in a peer reviewed journal, duplicate references, irrelevant references such as letters/editorials, a total of 31 studies were assessed in detail by the reviewers. Where a study was published in parts it was assessed as a whole and counted as a single study. There were 16 papers on Matrix included, 10 on Hydrocoil, 2 on Cerecyte and a single paper on fibered controlled detcah coils. 2 studies were excluded as being of too poor quality.
Detailed statistical analysis of recurrence, retreatment and rebleed rates will be presented at ESNR.
CONCLUSIONS
It is reassuring that complication rates are similar to the platinum coil litearature for all coated coil types, although relatively little data was available for some. Data on certain coated coil technologies seem promising with regard to reduced retreatment and recurrence rates. More detailed results will be presented at the ESNR Congress

Keywords:
Aneurysm
coated coils
matrix
hydrocoil
cerecyte
systematic review

B2:2:3

HELPS TRIAL: PRESENTATION OF UNBLINDED CLINICAL FOLLOW-UP DATA AND AN UPDATE ON PROGRESS

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PURPOSE
To provide new unblinded data arising from the randomized control trial of hydrocoil versus bare platinum in endovascular aneurysm treatment [HELPS] and an update on the progress of the trial.
Presented by the chief investigator on behalf of the Trial Steering Committee and trialists.
MATERIALS & METHODS
HELPS is a multicenter international randomized controlled trial with concealed allocation. Primary outcome is angiographic outcome in hydrocoil vs bare platinum arms. Groups are matched using appropriate minimization criteria. Angiographic analysis is performed by an independent core lab blinded to the patient allocation (CHUM, Montreal). Secondary outcomes include independently assessed clinical outcome [Modified Rankin Score], coil lengths used, packing density achieved, rebleed and retreatment rates. Analysis of results is on an intention to treat basis. The funders (Microvention Inc. and UK NHS) and trial sponsor (Lothian Health on behalf of UK NHS) have no control over the running of the trial and no access to the trial data. HELPS recruitment of 500 completed February 2007. Periprocedural results have been published.
RESULTS
Unblinded clinical follow-up data (data from both arms of trial compared) not presented previously will be provided at the ESNR meeting as well as other secondary outcomes not published to date and an update on overall trial progress.
CONCLUSIONS
HELPS is the first randomized control trial examining coated-coil technology for cerebral aneurysm treatment. Analysis of the blinded follow-up (independently assessed) clinical outcome data are encouraging and data available so far indicates that endovascular aneurysm treatment has improved since the benchmark laid down by the ISAT trial. Further unblinded data will be presente at ESNR.

Keywords:
Aneurysm
hydrocoil
randomized control trial

B2:2:4

ENDOVASCULAR TREATMENT OF 180 MIDDLE CEREBRAL ARTERY ANEURYSMS: CLINICAL OUTCOME AND LONG-TERM ANGIOGRAPHIC FOLLOW-UP

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PURPOSE
The aim of our study was to assess the relevance of endovascular treatment (EVT) of middle cerebral artery (MCA) aneurysms considering clinical outcome of patients, long-term treatment stability and recurrence risk factors.
METHODS
A retrospective analysis of angiographic imaging and clinical complications at immediate, early and late follow-up was performed in patients treated by EVT using detachable coils.
RESULTS
One hundred and fifty nine patients (92 women and 67 men) harboring 180 MCA aneurysms (102 ruptured and 78 unruptured) were intended to be treated by EVT and 166 aneurysms (92.2%) in 147 patients were coiled. At the end of the procedure, angiographic results showed a complete occlusion in 114 aneurysms (68.7%), and a partial occlusion in 52 (31.3%) with 28 residual neck (16.9%) and 24 residual aneurysm (14.4%). Acute angiographic complications (n=37, 22.3%) were observed in 35 procedures including aneurysm perforations (n=7, 4.2%), thromboembolic events (n=25, 15.1%) and arterial dissections (n=5, 3.0%). EVT induced permanent morbidity in 9 patients (6.1%) with severe impairment in 4 (2.7%) and mortality in 2 (1.4%). At 50±14 months follow-up, among 114 MCA aneurysms controlled by angiography, 73 remained completely occluded (64%), 31 recurrences (27.2%) were diagnosed and 12 retreated and completely occluded. The remodeling-technique was used in 63 of 166 aneurysms and identified as a significant factor of recurrence at long-term.
CONCLUSIONS
EVT of MCA aneurysms was safely performed with long-term permanent occlusion in 64% of the procedures. Moreover, aneurysm recurrences and EVT failures remain challenging groups that requires further technical refinements.

B2:2:5

RECRUITMENT OF PATIENTS FOR THE TEAM STUDY (TRIAL ON ENDOVASCULAR ANEURYSM MANAGEMENT): AN ACHIEVABLE GOAL

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BACKGROUND
TEAM is a randomized study comparing endovascular treatment to observation of unruptured aneurysms. Recruitment might be one of its main challenges. Recruitment rate was determined at our institution in order to estimate the clinical feasibility of the study.
MATERIALS & METHODS
Retrospective study of the consultations for unruptured aneurysms from the beginning of TEAM recruitment (June 2006) to October 2007 at our institution.
RESULTS
One hundred and eighty-eight (188) patients were seen for unruptured aneurysms. One hundred and thirteen (113) patients fulfilled the inclusion criteria of the TEAM study. The attending physician did not offer participation to 51 of these patients (45%) for various reasons (27 were treated and 24 were observed). Participation in the study was proposed to 62 patients (55%) and 11 (18%) accepted. Thirty-five patients refused to participate (21 chose to be treated and 14 chose surveillance). Sixteen patients never informed us of their decision. One of these patients died from rupture of her aneurysm 2 months after study was proposed.
CONCLUSION
At our institution, 18% of patients to whom the TEAM study was proposed accepted participation. A significant number of patients deferred their decision and did not contact us again.

* TEAM is funded by the Canadian Institutes of Health Research (http://www.cihr-irsc.qc.ca) and is registered: International Standard Randomized Controlled Trial Number (ISRCTN62758344) (www.controlled-trials.com)

B2:2:6

CLINICAL RESULTS OF CLARITY-GDC STUDY: PLACE AND RESULTS OF THE ENDOVASCULAR TREATMENT OF RUPTURED ANEURYSMS USING GDC COILS

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PURPOSE
To evaluate the place and results of the endovascular treatment in the management of ruptured intracranial aneurysms.
MATERIALS AND METHODS
A prospective, multicentric registry was conducted in France from October 2006 to June 2007 in 21 neurointerventional centers. 408 patients were included: 230 females (56.4%), 178 males (43.6%). Age was between 19 and 80 (mean: 51+-13 years).
RESULTS
Initial WFNS grade was 1 in 181 cases (44.4%), 2 in 89 cases (21.8%), 3 in 17 cases (4.2%), 4 in 62 cases (15.2%) and 5 in 59 patients (14.5%). Endovascular treatment failed in 10 cases (2.5%). Clinical complications related to the bleeding or the treatment were encountered in 76 cases (18.6%) including vasospasm in 33 cases (8.0%), thromboembolic events in 18 cases (4.4%), hydrocephalus in 9 cases (2.2%), and peroperative rupture in 1 case (0.3%). At hospital discharge, 302 patients (80.3%) were improved or unchanged, 23 had a clinical aggravation (6.1%) and 51 were dead (13.6%).
CONCLUSIONS
Clarity-GDC study demonstrate that the endovascular treatment of ruptured intracranial aneurysms is feasible in a high percentage of cases and is associated with a good global outcome.

B2:2:7

CLARITY STUDY: ANATOMICAL RESULTS OF THE ENDOVASCULAR TREATMENT OF RUPTURED ANEURYSMS USING GDC COILS - IS A NEW CLASSIFICATION USEFUL ?

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PURPOSE
For the evaluation of anatomical results of the Endovascular Treatment of intracranial aneurysms using GDC coils, a simple, precise and reproducible scale is necessary.
MATERIALS AND METHODS
The new scale is defined as follow: A = complete occlusion of aneurysm (coils are present inside the neck and no contrast media is visible in the coil mesh), B = subtotal occlusion including B1 = coils at the level of the neck and contrast media inside the coil mesh, B2 = the neck is not completely filled with coils and no contrast media is visible inside the coil mesh, B3 = the neck is not completely filled with coils and there is some contrast media inside the coil mesh, C = aneurysm remnant.
RÉSULTS
In both scales, inter observateur concordance was good. In J. Raymond scale, results were (consensus): complete occlusion: 150 aneurysms (48.0%), neck remnant: 120 aneurysms (38.5%), aneurysm remnant: 42 aneurysms (13.5%). In the new scale, results were (consensus): A: 119 aneurysms (38.1%), B1: 44 aneurysms (14.1%), B2: 64 aneurysms (20.5%), B3: 45 aneurysms (14.4%) et C: 40 aneurysms (12.8%). Aneurysms evaluated as complete occlusion in J. Raymond scale were A in 119 cases (79.3%), B1 in 30 cases (20.0%) et B2 in 1 case (0.7%). Aneurysms evaluated as neck remnant in J. Raymond scale were B1 in 14 cases (11.6%), B2 in 63 cases (52.5%), et B3 in 43 cases (35.8%). Aneurysms evaluated as aneurysm remnant in J. Raymond scale were B3 in 2 cases (4.8%) and C in 40 cases (95.2%).
CONCLUSIONS
A more precise analysis of post operative aneurysm occlusion is obtained with the new scale. Mid and long term follow-up is now necessary to evaluate the accuracy of this new scale.

B2:2:8

STENT MANAGEMENT OF COIL HERNIATION IN EMBOLIZATION OF INTERNAL CAROTID ANEURYSMS

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PURPOSE
Coil herniation into the parent artery is uncommon complication of embolization for intracranial aneurysms. Here we report (1) our experience with stent reconstruction of lumen and flow of the internal carotid artery (ICA) after coil herniation during embolization for intracranial ICA aneurysms and (2) possible mechanisms of coil herniation.
METHODS
Of 216 consecutive patients who underwent endovascular coil embolizations for intracranial aneurysms, 9 (4 men, 5 women; ages 32–68), underwent stent deployment after coil herniation to reconstruct the ICA lumen (n=8) or both lumen and flow (n=1). Wide-neck aneurysms were found in 8, narrow-neck in 1. Ruptured aneurysms were found in 6, while 3 were unruptured. Aneurysms were in the posterior communicating artery (n=5), and the paraophthalmic (n=3) and cavernous portions (n=1) of the ICA. Self-expandable stents were deployed in the ICA in 6; balloon-mounted stents were selected in 3.
RESULTS
The causes of coil herniation appeared to be coil instability after detachment (n=6), excessive embolization (n=1), microcatheter-related (n=1) or pushed by subsequent coil embolization (n=1). Endovascular stenting to reconstruct the lumen and/or flow of the ICA was technically successful in all 9 patients; one needed a second stent due to further coil migration to the distal artery. No significant procedural-related complications were found. Clinical follow-up was 8–35 months.
CONCLUSIONS
Coil herniation occasionally occurs during endovascular embolization of the ICA aneurysms because of coil instability after detachment, excessive embolization, microcatheter-related problems, or pushed by subsequent coil embolization. Stenting and reconstruction of the ICA lumen and/or restoring flow is a safe and effective method for managing this complication.

B2:2:9

PRELIMINARY RESULTS WITH MAGNETICALLY STEERED NANOPARTICLES FOR EXPERIMENTAL ANEURYSM EMBOLISATION

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PURPOSE
To test a novel embolisation material in experimental aneurysms whereby after intra-arterial administration of magnetic nanoparticles these are navigated into the aneurysmal lumen with assistance from an external magneticfield.
METHODS
A magnetically steerable substance (Magseal ©, APG Ltd., Newbury, UK) was used to fill experimentally induced aneurysms in rabbits. The substance constisted of Core-Shell (CS) Particles suspended in saline. The particles had a shell made of a polymeric material and a core made of magnetite (Fe3O4). The diameter of the CS particles was 1,4 micrometers. To stabilize the CS particles in suspension, they were coated layer by layer (LBL) with a positively charged polymer and a negatively charged polymer such that the outer layer was negative. To prevent the magnetite cores from becoming permanently magnetized, they were comprised of a multiplicity of nanoparticles. During Magseal administration via a microcatheter, a magnetic field (0.125 T, 0.013 Tesla/mm) was applied to the aneurysm. The magnetic field was generated using solid state neodymium magnets. The magnets were placed externally to the animals body.
RESULTS
It was possible to steer and hold the nanoparticles within the aneurismal cavity where they occluded the lumen progressively. After removal of the external magnetic field, the results remained stable for the remainder of the observational period (30 minutes), however, after a 4 week observational period, recanalization of the aneurysm occured. Multi-organ histological examination did not identify any adverse findings.
CONCLUSIONS
Magnetic nanoparticles can be magnetically directed into aneurysms allowing short term obliteration. Although the method has yet to show reliable long term stability, these experiments provide the proof of concept encouraging further investigation of intravascular magnetic compounds. The small size of the particles allows capillary penetration without their occlusion.

B2:2:10

HYDROCEPHALUS IN UNRUPTURED BRAIN ARTERIOVENOUS MALFORMATIONS. PATHOMECHANICAL CONSIDERATIONS, THERAPEUTIC IMPLICATIONS AND CLINICAL COURSE

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PURPOSE
To present possible pathomechanisms, clinical, and imaging findings, management and outcome of patients with hydrocephalus in unruptured pial brain arteriovenous malformations (AVMs).
METHODS
Medical records and imaging findings of eight consecutive patients with hydrocephalus from AVMs managed between June 2000 and September 2007 were retrospectively reviewed to determine clinical symptoms, AVM-location, venous drainage, level/cause of obstruction and degree of hydrocephalus. Management of hydrocephalus, AVM-treatment, complications and follow-up results were evaluated.
RESULTS
Headaches were the most common clinical symptom (7/8). Deep venous drainage was identified in all patients. Mechanical obstruction by the draining vein or the AVM nidus was seen in 6 patients, obstruction occurred at the interventricular foramen (n=2) or the aqueduct (n=4). Hydrodynamic disorders following venous outflow obstruction and venous congestion of the posterior fossa led to hydrocephalus in the remaining two patients. Ventriculoperitoneal (VP) shunts were placed in 6/8 patients with moderate to severe degree of hydrocephalus. Regression of hydrocephalus was noted in 4 patients, while in two patients imaging findings were stable, one of whom had decreased hydrocephalus only after AVM size reduction. Two patients with mild hydrocephalus were not treated by shunting, one improved and one was clinically stable after AVM-treatment.
CONCLUSIONS
The most common cause of hydrocephalus in unruptured BAVMs is mechanical obstruction by the draining vein if it is located in a strategic position. Management should be aimed at treatment of the AVM, however, VP shunts may be necessary in acute and severe cases of hydrocephalus.

B2:2:11

COMPARATIVE ANALYSIS OF ENDOVASCULAR AND MICROSURGICAL TREATMENT OF THE INTRACRANIAL AVMS

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PURPOSE
To analyze comparatively two treatment methods of AVMs: endovascular embolization and microsurgical resection.
MATERIAL AND METHODS
Forty consecutive AVMs in 40 patients aged 4–60 yrs treated 2002–2006 have been analyzed retrospectively. Twenty of the 40 patients were treated by microsurgical resection (S-subgroup), while 20 remaining patients (E-subgroup) underwent 36 embolizations (6 patients had 2 sessions, 5 -3 sessions). There were twelve emergency cases (8 in S-subgroup and 4 in E-subgroup) Embolizations were performed with histoacrylic glue. Microsurgery included complete resection of the visible AVM and clipping of the feeding artery, in emergency cases also removing of haematoma. The results of the treatment method were assessed on the last day of hospitalization according to Glasgow Outcome Scale(GOS).
RESULTS
In both E and S-subgroups the most common AVMs were those with 3 points in Spetzler-Martin classification(SMC) (6 and 9 AVMs respectively). Mean SMC scores were 2.8 and 2.5 respectively. The degree of nidus embolization ranged from 20 to 100% and depended on SMC score (100% for 1 point, 63% for 2 points, 45% for 3 points, 26% for 4 points and 20% for 5 points). In 15 out of 20 surgical cases, AVM was removed totally, while in 5 cases residual nidus was found in follow-up CT and/or angiography. In E-group mean GOS score at discharge from hospital was 4,4 points while in S-group 3,9 points. The mean duration of hospitalization (in case of multiple embolizations hospitalizations during all sessions were summed up) was 14 days in E-subgroup and 23 days in S-subgroup.
CONCLUSIONS
Intravascular and microsurgical methods in many cases do not provide total cure of the AVM. Combination of these two methods and close cooperation between interventional neuroradiologists and neurosurgeons seems to be necessary to optimize the treatment results, to shorten hospitalization period and reduce the costs of the AVM therapy.

Lecture Hall 'A'

A3
15.00–16.10 - Spine and Spinal cord

A3:3:1

OCCULT NEURAL FORAMINA STENOSIS DETERMINATED BY ASSOCIATION BETWEEN DISK DEGENERATION AND FACET JOINT OSTEOARTRITIS. DEMONSTRATION WITH DEDICATED UPRIGHT MRI SYSTEM

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PURPOSE
To evaluate the relationship between disk degeneration and facet joint osteoartritis with or without thickening of ligamentum flavum and dynamic foraminal stenosis with MRI dedicated system (G-scan Esaote, Genova, Italy).
MATERIAL AND METHOD
In a period of 24 months, a total of 65 patients with low back pain (age 40–65 y; 27/26 m/f) were examined. Disk appearance on MRI from normal to advanced degeneration, osteoarthritis changes in facet joint, ligamenta flava and dimension of neural foramina were

evaluated on both the supine and upright position on the pathological level and at least an other apparently normal one. The modification of lumbar lordosis angle and lumbar sacral angle were also considered. 42 patients have performed plain film examination and 27 TC scan. The modifications of dimension of neural foramina on dynamic MRI study was compared with the presence of disk and facet degeneration using statistical analisis. (McNemara'test with the continuity correction).
RESULTS
Our result show that when the MRI disk appearance was normal (53 level: 35 at L3–L4 and 18 at L2–L3 level), the dimension of neural foramina (NF) did not change from recumbent to the upright position with or without facet osteoartrosis (6/65 cases). The dimension of NF not change in presence of isolated disk alteration (35/65 cases: 28 at L4–L5 and 7 at L5–S1 level) but reduce itself when disk pathology was associated with facet artrosis (40/65cases $P<0.05$). The occult stenosis was more evident when there was thickening of ligamenta flava. In 49/65 cases there was modification of lumbar lordosis angle and lumbar sacral angle.
CONCLUSIONS
Our data show that the association between disk pathology and facet osteoartrosis can determine foramina occult stenosis not visible a conventional MRI examination. Strategies to image the spine under physiological load may improve the clinical diagnosis of radicular pain.

A3:3:2

UPRIGHT MRI OF SPONDYLOLYSIS AND SPONDYLOLISTHESIS

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PURPOSE
Spondylolisthesis due to spondylolysis is a common disorder of the lumbar spine. Most patients present with lumbago or sciata, however some patients present with symptoms due to nerve root compression or spinal canal stenosis. Upright MRI offers the possibility to evaluate the static and dynamic situation of the lumbar spine in a sole examination.
METHODS
We present a series of 84 patients with spondylolysis and with or without complicating spondylolisthesis. In all patients history was taken, the neurological status asset and a dynamic Upright MRI of the lumbar spine performed. A neuroradiologist and a neurosurgeon evaluated the images in regards to a slip of the vertebra of the affected level and instability in the slip. Instability of the slip was defined as anterior instability. Furthermore the situation in the spondylolytic cleft was examined. Changes in the structure of the cleft were defined as posterior instability.
RESULTS
83 of the spondylolysis were bilateral. In 71 cases an anterior slip was present, however 24 patients had a dysplastic form of L5 thus simulating an anterior slip. 10 patients presented with anterior instability, 25 patients presented with posterior instability. Stenosis of the neuroforamina could be seen in 67 patients, however only 34 patients had symptoms due to nerve root compression. Patients presenting with symptoms of nerve root compression had more often anterior or posterior instability as compared to the patients presenting only with lumbago or sciata. Anterior and posterior instability were both equally common in these patients, though only posterior instability was associated with a stenosis of the recesses at the affected level.
CONCLUSIONS
The evaluation of patients with spondylolysis of the lumbar spine using Upright MRI offers new insights in several forms of instability which may lead to radicular symptoms through nerve root compression or stenosis of the recess.

A3:3:3

MRI-ASSESSMENT OF THE ALAR LIGAMENTS IN WHIPLASH INJURIES, A CASE-CONTROL STUDY

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PURPOSE
Conflicting evidence exists whether areas of high signal intensity in the alar ligament on magnetic resonance imaging (MRI) are more frequent in whiplash patients than in non-injured control subjects.
METHODS
A case-control designed study of 173 subjects, included one group with persistent whiplash associated disorders (WAD) grade I-II after a car accident (n=59), one with chronic non-traumatic neck pain (n=57) and one group without neck pain or previous neck trauma (n=57). High-resolution proton-weighted imaging in three planes on a 1.5 Tesla MR system was used. The images were independently evaluated by two experienced neuroradiologists, who were blinded to patient history and group allocation. The alar ligaments were evaluated according to a 4-point grading scale; 0=low signal intensity throughout the entire cross section area, 1=high signal intensity in one third or less, 2=high signal intensity in one-third to two thirds, and 3=high signal intensity in two thirds or more of the ligament cross section.
RESULTS
Alar ligament changes grades 0–3 were seen in all three diagnostic groups. Areas of high signal intensity (grade 2–3) were found in at least one alar ligament in 49% of the patients in the WAD grade I-II group, 33% in the chronic neck pain group and 40% in the control group (Chi-square, p=0.22).
CONCLUSIONS
The previously reported assumption that these changes are due to the trauma itself, is not supported by this study. The diagnostic value and the clinical relevance of MR-detectable areas of high intensity in the alar ligaments is limited.

A3:3:4

MR IMAGING CHARACTERISTICS OF SPINAL SUBEPENDYMOMA

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BACKGROUND AND PURPOSE
Subependymoma is a rare, benign glial tumor observed mainly in the 4th or lateral ventricles and rarely in the spinal cord. There have been only 44 reported cases of spinal subependymoma since 1954. Most of them were reported in non-radiological literature. We would like to describe the MR appearance of spinal subependymoma and review associated literature.
PATIENTS AND RESULTS
MR images of three patients who developed spinal subependymoma between 1995 and 2007 were reviewed. They consisted of one male and two females ranging in age from 37 to 66. One tumor was in the cervical, one in the cervicothoracic, and one in the thoracic cord. All three cases were intramedullary, showed hyperintensity on T2-weighted images, and were eccentric in location on axial images. Contrast enhancement studies showed no enhancement, multinodular enhancement, and faint, heterogeneous enhancement, respectively. At surgery, all cases were eccentrically located and had a clear distinction between the tumor and the cord. Two cases were subpial. The tumor was totally removed in two and subtotally resected in one case, in which a small nodule was present at the opposite side of the cord separate from the main tumor.
CONCLUSIONS
Spinal subependymoma seems to have characteristic MR findings of marked hyperintensity on T2-weighted images, eccentric location, and various degrees of contrast enhancement. Differential diagnosis includes low-grade astrocytoma, which seems to have somewhat different hyperintensity on T2-weighted images. Radiologists play an important role in treatment since this tumor can be completely removed in most cases.

A3:3:5

IMPACT OF UPRIGHT, MULTI-POSITIONAL, FUNCTIONAL MRI (FMRI) ON THERAPEUTIC DECISION MAKING IN CERVICAL SPINE PATHOLOGIES

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INTRODUCTION
The introduction of the MRI in the eighties improved the diagnostic possibilities and accuracy in spine investigation. However some symptomatologies presented by patients still remain unexplained. The recumbent MRI underestimates the dynamic component of degenerative and posttraumatic changes of the cervical spine. We are presenting new entities in MR investigation of the degenerative spine: the dynamic central and foraminal stenosis revealed by functional imaging under weight bearing conditions (fmri).
METHOD
Patients who developed pain and/or neurological deficit of their cervical spine with negative recumbent MRI were studied in sitting upright neutral, flexion-extension and even in rotation in our center.
DISCUSSION
These cases let us relatively perplex as conventional recumbent MR imaging has missed these new entities. The real potential of this new modality of spine investigation is presently under-recognized. For all of them an adequate conservative treatment was not satisfactory for the patient nor for the treating doctor. In some cases fmri revealed a tethering and/or compression of the cord at the cranio-cervical junction during flexion, dynamic foraminal and /or central stenosis mostly in extension combined or not with instabilities.
The personal, familiar and socio-economical benefit of an adequate investigation and treatment is in these cases evident.
CONCLUSIONS
Dynamic MR Investigation is now feasible and seems to become the method of choice in unresolved and/or unexplained pathology in posttraumatic and degenerative cervical spine.. The origin of some cervical pathology is often unexplained, as a correlation between patient's complaints, clinical signs and imaging findings is missing. Investigation of these unexplained pathologies is now possible under weight bearing conditions and the results of upcoming studies will further document the potential of this new functional and dynamic MR. In the near future fmri may become mandatory for the investigation of complex spinal pathologies, especially when no obvious explanation can be derived from conventional imaging.

A3:3:6

"WHITE FACET" SIGN AND LUMBAR INSTABILITY: EVALUATION USING MRI IN RECUMBENT AND UPRIGHT POSITION

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INTRODUCTION
Dynamic radiographs (standing lateral flexion-extension,SLFE) is the most accurate diagnostic tool to detect lumbar instability(LI). MRI can not reveal it, since vertebral listhesis may not be evident in supine position. According to recent previous studies, the evidence of high signal intensity within the facet joints in T2w images is significantly associated with LI. We call this MR finding "white facet" (WF) sign. Aim of our study was to verify the diagnostic value of the WF sign for LI, by means of MRI performed both in recumbent and upright positions.
METHODS
MRI lumbar examinations of 73 patients, studied for low back/radicular pain, showing the WF sign in at list one of the last lower 3 lumbar level, were retrospectively evaluated.
The supine MRI were performed using a 1.5T(Signa Horizon, GE)and/or a 0.25T(G-scan,Esaote) MR unit; all patients also underwent MRI in the upright position, using a 0.25T. 40pts underwent to SLFE radiographs too. The supine MRI were evaluated to detect the WFsign in L3–L4,L4–L5 and L5–S1.On the upright MRI the change of WFsign was evaluated, due to the redistribution of intrarticular fluid by facets shifting.The anterior vertebral translation was also evaluated.
RESULTS
The data were analyzed using the Cohen test:a significant redistribution of the facet joints fluid was observed in the upright MRI at L4–L5 and L5–S1 levels(K of Cohen<0.2,$p<0.001$).The intrarticular fluid change in upright MRI correlates with the amount of facet effusion.
In all cases of anterior vertebral translation on SLFE we observed a significant association with both the presence of WF sign in recumbent position and its change in upright position.
CONCLUSIONS
Our study confirms that WFsign on supine MRI examination is a possible sign of LI.Our preliminary experience suggests that upright

MRI is highly sensitive to confirm the eventual associated LI, thus reducing the need of SLFE radiographs.

A4
16.15–17.25 - Inflammatory/Demyelinating/Degenerative Diseases of the Brain

A4:4:1

CLINICAL AND MRI FEATURES OF PSEUDOTUMORAL IDIOPATHIC INFLAMMATORY DEMYELINATING LESIONS

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PURPOSE
To analyze the clinical and radiological features of pseudotumoral idiopathic inflammatory demyelinating lesions.
MATERIALS AND METHODS
Retrospective, multicenter, observational study of pseudotumoral idiopathic inflammatory demyelinating lesions (PIIDL) demonstrated with magnetic resonance (MR) imaging. Inclusion criteria: focal hemispheric lesions larger than 25 mm in size, MR study performed in the acute phase of lesion development; and final diagnosis based on biopsy or clinical-MR follow-up (minimum 6 months). Demographics, and clinical and MR features were assessed.
RESULTS
Thirty-eight patients were included in the study (25 female; mean age 30 years;). Diagnosis of PIIDL was obtained by biopsy in 9 patients, and by clinical-MR follow-up in the remaining 29. In 16 cases the lesion presented as a monophasic clinical syndrome, in 14 cases as the first manifestation of a relapsing-remitting form of multiple sclerosis, and in 8 during the clinical course of relapsing-remitting multiple sclerosis.
In 30 cases the pseudotumoral lesion was associated at presentation with multifocal white matter lesions. A Balo-like or cystic appearance was present in 8 and 18 lesions, respectively. All but three lesions showed contrast-uptake, 8 with a heterogeneous pattern, 20 with an open-ring pattern, and 7 with a closed-ring pattern. Perilesional edema or mass effect were minimal or absent in most cases.
CONCLUSIONS
Pseudotumoral idiopathic inflammatory demyelinating lesions usually seen on MRI as large, single or multiple focal lesions located in the brain hemispheres. Clues that can help to differentiate them from a brain tumor are the relatively minor mass effect and the presence of incomplete ring-enhancement on gadolinium-enhanced T1-weighted images. Knowledge of the clinical and MRI features of these lesions has diagnostic implications, as it may help to distinguish them from tumoral or infectious lesions, avoiding unnecessary aggressive diagnostic or therapeutic procedures.

A4:4:2

ROLE OF NEUROIMAGING IN AUTOIMMUNE DISEASES OF THE CNS

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PURPOSE
To present our experience as well as to stress out the important role of neuroimaging in the diagnosis of autoimmune diseases of the CNS and its differential diagnosis.
PATIENTS AND METHODS
The last 15 years neuroimaging was performed in patients with autoimmune diseases using a 1.5 T MR unit and conventional as well as multi-slice CT. Proton density, T2 weighted, FLAIR images and a SE T1 weighted sequences in 3 planes with and without contrast medium administration (gadolinium-DTPA, 0.2 ml /kg body weight) were used. CT protocol included contiguous axial 3 mm slices in the posterior cranial fossa and 8 mm in the supratentorial compartment. Correlation with clinical and laboratory findings followed.
RESULTS
The following lesions were found and are analyzed: 1) Multiple Sclerosis - MS, 2) Acute Disseminated Encephalomyelitis - ADEM, 3) Subacute sclerosing panencephalitis, 4) Acute transverse myelopathy - ATM, 5) Guillain-Barré Syndrome, 6) Rheumatoid Arthritis, 7) Vasculitides (primary of the CNS, Takayasu arteritis, polyarteritis nodosa, giant-cell (temporal arteritis), Systemic Lupus Erythematosus, Antiphospholipid Antibodies Syndrome, Neuro - Behçet, Neurosarcoidosis, Amyloid Angiopathy and Wegener's Granulomatosis), 7) PRES syndrome, 8) Lymphocytic Hypophysitis (adeno- and neuro-hypophysitis), 9) Tolosa-Hunt syndrome and 10) Hashimoto encephalopathy. Many of these entities cause still ill-defined neurological syndromes and need a very intense imaging and laboratory workup to establish the correct diagnosis.
CONCLUSIONS
CT and MRI are complementary imaging modalities. In correlation with neurological and laboratory findings they establish the correct diagnosis of autoimmune diseases.

A4:4:3

T2′IMAGING INDICATES REDUCED METABOLISM IN MS PATIENTS

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BACKGROUND AND PURPOSE
The feasibility of T2′-MRI in estimating values for oxygen extraction facilitates the investigation of metabolism in MRI in normal appearing white and gray matter. The processes of demyelinisation, gliosis and axonal destruction in MS is assumed to induce an alteration in metabolism. We hypothesized that these changes can be displayed by T2′-MRI in MS patients.
MATERIALS AND METHODS
T2- and T2*-weighted images with three echotimes were acquired in 20 MS patients (range: 23–52 years) and 20 age-matched healthy subjects (range: 24–61 years). Quantitative T2 and T2* maps were calculated by a fit of the measured data to exponential decay curves and T2 and T2′values were determined in 6 distinct regions of interest (ROIs) in each hemisphere including gray matter (GM) and white matter (WM). ROIs were placed exclusively in locations without apparent lesions in T2w imaging.
RESULTS
The T2′values in caudate nucleus and thalamus were significant lower in MS patients than in healthy subjects (103 ms vs. 117 ms, $p=0.006$, 140 ms vs. 157 ms and $p=0.012$ respectively). The NAWM in the frontal lobe revealed significant higher T2′values than in healthy subjects (217 ms vs. 173, $p<0.000$). There was no significant effect in the NAWM occipitoparietal, subcortical WM of the central region, lentiform nucleus. There were no significant differences in T2 between patients and healthy subjects.
CONCLUSIONS
The T2′ values differed significantly in MS and healthy subjects. We hypothesize that the reduced T2` values in caudate nucleus and thalamus are most likely related to a higher iron tissue concentration. The increased T2′ in frontal NAWM might be explained by a decreased oxygen extraction due to reduced metabolism, compatible to results of prior PET studies. T2′ imaging is a functional technique feasible for routine use. It seems promising for monitoring therapy effects not apparent in standard imaging.

A4:4:4

THE USE OF SUBTRACTION IMAGING IN INCREASING DETECTABILITY OF ENHANCING BRAIN LESIONS IN MULTIPLE SCLEROSIS PATIENTS

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PURPOSE
The aim of this study was to determine whether image subtraction can improve the detection of enhancing lesions in brain MR imaging of multiple sclerosis (MS) patients.
MATERIALS AND METHODS
Fifty patients with clinically definite MS underwent 1,5- T MR imaging of the brain using axial spin-echo T1 weighted sequences without and with magnetization transfer (MT), repeated after 0.1 mmol/Kgr of a paramagnetic contrast agent. Two sets of subtraction images (SI) were obtained by subtracting the pre from the post-contrast images, namely SI for the non-MT images and SI-MT for the MT images. The numbers of enhancing lesions on post-contrast T1 and T1-MT, and on subtracted images SI and SI-MT were determined on film through the consensus of two neuroradiologists and the difference was compared with the Wilcoxon test.
RESULTS
A significant difference was found between the numbers of enhancing lesions in post-contrast T1 images and SI images ($p=0.013$). The SI allowed the detection of 25 more enhancing lesions compared with post-contrast T1 images. A significant difference was also found between the numbers of enhancing lesions in post-contrast T1-MT images and SI-MT images ($p=0.015$). The SI-MT allowed the detection of 20 more enhancing lesions compared with post-contrast T1-MT images. There was no significant difference in the numbers of enhancing lesions identified on SI compared with SI-MT images.
CONCLUSIONS
Subtraction can be used as a simple, fast and reliable method to evaluate enhancing brain lesions in patients with MS. The number of enhancing lesions is increased with subtraction compared to post contrast images.

A4:4:5

DIFFERENTIAL DIAGNOSIS BETWEEN TUMEFACTIVE MULTIPLE SCLEROSIS AND BRAIN TUMOURS USING PERFUSION MAGNETIC RESONANCE IMAGING

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INTRODUCTION
Multiple sclerosis (MS) is a chronic inflammatory demyelinating disease of the central nervous system. Whereas MS has traditionally been characterized on conventional MRI, the tumefactive MS is difficult to distinguish from brain tumours due to their similarities at conventional MRI. Functional MRI has demonstrated to be useful at the differential diagnosis of inflammatory brain diseases versus brain tumoral pathology.
OBJECTIVE
The purpose of this study was to evaluate the utility of functional magnetic resonance imaging (perfusion MRI) in differential diagnosis between tumefactive multiple sclerosis and brain tumours.
METHODS
Prospective study of two patients with tumefactive multiple sclerosis diagnosed by MRI and confirmed by biopsy. We compared these cases with perfusion MRI in 10 different high-grade brain tumours, all of them confirmed by biopsy (anaplastic astrocytoma, glioblastoma multiforme, anaplastic oligodendroglioma and anaplastic oligoastrocytoma).
Relative cerebral blood volume (CBV), cerebral blood flow (CBF), and mean transit time (MTT) were calculated.
RESULTS
We found in tumefactive MS that perfusion MRI was significantly different than those found in brain tumours. The enhancement area of tumefactive MS has normal perfusion values. The enhancement area of high grade tumours demonstrate higher CBV and CBF values ($p<0.001$) than tumefactive MS, without differences in MTT values ($p=0.5$).
CONCLUSIONS
Perfusion MRI can be a useful tool for differential diagnosis between tumefactive MS and high-grade brain tumours. This distinction has important implications for prognosis and treatment.

A4:4:6

PRESURGICAL AND POSTSURGICAL FINDINGS IN REFRACTORY PATIENTS WITH ANTERIOR TEMPORAL LOBE RESECTION. ARE THEY PREDICTIVE FACTORS OF SURGICAL OUTCOME?

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OBJECTIVE
To determine if the presurgical and postsurgical findings after anterior temporal resection in refractory epilepsy patients are predictive factors of surgical outcome.
MATERIAL AND METHODS
Thirty-five refractory epilepsy patients with anterior temporal lobe resection were retrospectively revised. All patients had temporal lobe seizures and were previously EEG-video monitored. Magnetic resonance were performed before and after surgery following a specific epilepsy protocol that include 1.5 mm slice coronal SPGR, 3 mm slice coronal FLAIR and T2WI centred in temporal lobe. Presurgical findings, the extend of resection, and post surgical findings such hemosiderin and malacia were evaluated. Annual clinical follow-up was performed using International League Against Epilepsy criteria.
RESULTS
Twenty-three patients had mesial sclerosis, 5 patients had dual lesions, 3 patients had tumour lesions and in 4 patients MRI were normal. All patients with tumour lesions had good outcome while three of the four patients with normal MRI had seizures after surgery. Patients with mesial sclerosis had good outcome in 67% of the cases. In 22 patients the anterior temporal lobe resection was complete though 7 patients had seizures after surgery. In 12 patients, hyperintense hippocampus tail and /or body were present in the postsurgical studies although 58% of these patients were free of seizures after surgery.
CONCLUSIONS
Presurgical findings in refractory epilepsy are predictive factors of good outcome, however incomplete hippocampus resection was not a indicator of seizure recurrence after surgery.

A4:4:7

RELATIONSHIP OF INCOMPLETE HIPPOCAMPAL INVERSION AND EPILEPSY

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PURPOSE
Incomplete hippocampal inversion (IHI) has been described most often in patients with epilepsy or severe midline malformations but also in 19% of nonepileptic subjects without obvious developmental anomalies. To study the relationship of IHI and epilepsy we evaluated the frequency of IHI in different epilepsy syndromes.
METHODS AND MATERIALS
300 patients were drawn from the regional epilepsy register. 99 were excluded because of a disease or condition affecting the temporal lobes, or incomplete data. Controls were 150 subjects without epilepsy and obvious intracranial developmental anomalies. The hippocampi were analysed in coronal MR images without knowing clinical data.
RESULTS
60/201 (30%) epilepsy patients had IHI (40 left-sided, 4 right-sided, 16 bilateral). 28/150 (18%) controls had IHI (20 left-sided, 8 bilateral). The difference was statistically significant ($p<0.05$). The frequency was not statistically significantly higher in temporal lobe epilepsy (TLE) than in controls ($p=0.34$): 14/57 (25%) had IHI (11 left-sided, 2 right-sided and 1 bilateral). There was no correlation between EEG and IHI laterality. 11/25 (44%) Rolandic epilepsy patients had IHI (9 left-sided, 1 right-sided, 1 bilateral). 12/21 (57%) cryptogenic generalised epilepsy patients had IHI (5 left-sided, 7 bilateral).
DISCUSSION
The IHI frequency is very high in some epileptic syndromes but the frequency was not significantly higher in TLE than in controls. No causality between TLE and IHI could be found. We conclude that IHI is not aetiology to epilepsy but can be a sign of disturbed cerebral development affecting other parts of the brain in a way leading to epilepsy.

Lecture Hall 'B'

B4
15.00–16.10 - Interventional Neuroradiology: Brain II

B4:4:1

T-OCCLUSION OF THE CAROTID SIPHON: INTRA ARTERIAL THROMBOLYSIS IN 21 PATIENTS

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BACKGROUND
T-occlusion of the carotid siphon has a very poor prognosis with near half deaths and less than 20% of good clinical evolution.
PURPOSE
To evaluate the interest of intra arterai thrombolysis on a retrospective monocentric study of 21 patients trated in the first 6 hours.
METHODS
Patients: 21. 14 women, 7 men. Mean age 58,4 years (range 31–84 years). Mean NIHSS 18,9 (range 12–33). Mean delay of treatment 262,4 minutes (range 180–330 minutes).
Treatment: « Mechanical » Thrombolysis with the guide wire and pulsed injection of 900.000 UI of Urokinase in 7 cases et de 0,9 mg/kg of rTpa in 8 cases. Mechanical thrombolysis alone in 6 cases.
RESULTS
Immediate Angiographic results: failure in 6 cases (28,6%), recanalisation TIMI 1 in 5 cases(23,8%), TIMI 2 in 8 (38,1%), and TIMI 3 in 2 cases (9,5%). Hemmorrhagic transformation: 9 cases (42,9%)
Clinical evolution: 6 patients (28,6%) died in the first week. At 3 months, 10 patients (47,7%) were independent (mRS 0–1), 2 have an mRS à 2 (9,4%) and 3 an mRS at 3–4 (14,3%).

CONCLUSIONS
T - occlusion of the carotid siphon remain a poor location. Mechanical and chemical thrombolysis improve the prognosis and should be proposed as the first therapeutic option

B4:4:2

PRELIMINARY EXPERIENCE WITH A DEDICATED THROMBASPIRATION SYSTEM (PENUMBRA TM) FOR SUPERSELECTIVE RECANALIZATION IN ACUTE STROKE

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BACKGROUND AND PURPOSE
Application of local intraarterial thrombolysis is limited by the risk of reperfusion heaemorrhage. Utilization of mechanical recanalization techniques might be beneficious by shortening procedure time and eliminating or decreasing the need of thrombolytic agents and subsequently reducing the risk of haemorrhage. The purpose of this study is to present our early experience with a mechanical thrombaspiration system: the PenumbraTM device.
METHODS AND MATERIALS
Since November 2007, a total of 14 acute stroke patients were treated by superselective intraarterial thrombaspiration between 3 and 6 hours post ictus. The PenumbraTM dedicated intracranial thrombaspiration system was used in each case. This system consists of a 2,6–4,1 F aspiration microcatheter, a special microwire and a vacuum pump providing a constant negative pressure of -20 atm-s. Additional superselective injection of rtPA was used if needed, and intravenous thrombolysis was applied if for any reason the procedure was delayed. Recanalization rates, incidence of haemorrhagic complications and clinical outcomes were recorded.
RESULTS
Embolic occlusion was indentified in the Middle Cerebral Artery in 7, in the Carotid T in 3 and in the Basilar Artery in 4 cases. Complete recanalization was achieved in 5 (36%), and partial in 8 (50%) cases. The procedure remained unsuccessful in 2 cases (14%). Additional local rtPA injection was necessary in all but one case, not exceeding a maximum of 15 mg dose. At 30 days following ictus, 8 patients (57%) reached a modified Rankin score (mRS) of 1 and 2, 4 patients (28%) were dependent (mRS 3 and 4) and 3 patients (21%) died. Two patients (14%) had haemorrhagic complications.
CONCLUSIONS
Superselective thrombaspiration with adjunctive local thrombolysis is an effective recanalization technique in acute stroke that can be safely applied within a 6 hours time window without an increased risk of reperfusion hameorrhage.

B4:4:3

REVASCULARIZATION WITH THE PENUMBRA SYSTEMTM IN ACUTE STROKE WITH MAJOR CLOT LOAD: INITIAL EXPERIENCE

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BACKGROUND AND PURPOSE
Major cerebral thromboembolism resists often current recanalization methods. We present our initial experience with the Penumbra thrombaspiration system used for intracranial revascularization in the setting of acute thromboembolic occlusions in the anterior cerebral circulation.
MATERIALS AND METHODS
Presenting acutely with a severe ischemic stroke during a 2 months period, eleven consecutive patients with major anterior circulation clot load were considered for treatment. CTA showed a carotid T and/or middle cerebral artery M1 segment occlusion in all cases. Treatment included in all use of the Penumbra thrombaspiration system, that was combined with intraarterial thrombolysis in 8 cases. Safety and feasibility of the system, recanalization rate by means of TICI scores and a short term clinical outcome were all assessed.
RESULTS
The mean NIHSS score at presentation was 10. Successful recanalization was achieved in 100% of cases with a TICI score of 2a (two cases), 2b (three cases) and 3 (complete recanalization) in the remaining six cases (54%). The mean time needed to achieve the final revascularization after the first contrast injection was 112 minutes (range 60–199 minutes). The mean NIHSS score at 10 days was 5 (range 0–17). One patient died, but none of the other patients worsened, showing a mean NIHSS-score improvement of 5 (range 0–12). Five out of 11 patients (45%) showed a complete recovery at 10 days. Intraprocedural complication was encountered in one case consisting of a lenticulostriate artery perforation with a minor subarachnoid hemorrhage.
CONCLUSIONS
Use of the PenumbraTM thrombaspiration system proved to be safe, feasible, efficient and rapid for recanalization of occluded main cerebral arteries. Our initial experience with this system showed a high potential to reach rapid recanalization of acute major thromboembolic occlusions and was associated with good clinical outcome in the short term.

B4:4:4

EVIDENCE OF IMPROVED OUTCOMES FROM REVASCULARIZATION BY THE PENUMBRA MECHANICAL THROMBECTOMY DEVICE

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PURPOSE
Current therapies for acute stroke have many limitations. The Penumbra System is a novel mechanical thrombectomy device using separator-assisted aspiration to achieve revascularization. The purpose of this study was to assess the extent to which revacularization from this System affects outcomes in patients with acute stroke.
METHODS
Main entry criteria were NIH Stroke Scale (NIHSS) score >8, presentation within 8 hours of symptom onset, and an occlusion (TIMI 0 or 1) of a treatable intracranial vessel. 125 patients were treated by the Penumbra System at 24 international centers.

RESULTS
Mean values at baseline were: age 64 years, NIHSS score 17.6 (range 8 to 34), mRS 4.5, and all 125 target vessels had TIMI 0 or 1 flow prior to treatment. After use of the Penumbra System, 82% of the treated vessels were revascularized to TIMI 2 or 3, 42% had good clinical outcome at 30 days (defined as mRS <2 or a >4 point improvement on NIHSS), 25% had mRS <2 at 90 days. The results for opened (TIMI 2–3) vs. closed vessels (TIMI 0–1) were (2-tailed Fisher's Exact Test): Good Clinical Outcome at 30 Days: 46.1% vs 21.7% (p=0.0368); mRS <2 at 90 Days: 28.9% vs 8.7% (p=0.0596), Death at 30 Days: 24.5% vs 34.8% (p=0.3085), Death at 90 Days: 29.4% vs. 47.8% (p=0.1384).
CONCLUSIONS
These data indicate that there was a trend for improved outcomes when vessels were successfully revascularized by the Penumbra System across all measures of neurological and functional status.

B4:4:5

THROMBUS ASPIRATION IN ACUTE ISCHEMIC STROKE

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PURPOSE
High thrombus load and tandem intra- and extracranial artery occlusion predict poor outcome after IV thrombolysis (IVT), thus demanding more aggressive reperfusion methods.
METHODS
twenty-three consecutive patients (15 male; aged 37 to 86, mean and median age 64 years) underwent thrombus aspiration with the Penumbra System™ within 8 hours after stroke onset (one patient later than 8 hours). Initial CT excluded intracranial blood or larger infarcts. CT-angiography assessed arterial occlusion.
RESULTS
We treated 14 patients with proximal MCA occlusion (8 patients had concomitant extracranial ICA occlusion or severe stenosis) and 9 patients with basilar artery occlusion (5 patients had concomitant severe stenosis or occlusion of a vertebral artery). Twenty patients had received IV tPA before thrombus aspiration without success. We achieved recanalization (TIMI flow grades 2 and 3) in 14 patients (anterior circulation: 8). Among these, supplementary stent protected angioplasty was performed in 6 patients, angioplasty alone in another 3. Recanalization was not successful in 6 patients (TIMI 0). In 3 patients we only achieved flow grade 1. We observed parenchymal hemorrhage in two patients. Six patients died, one from cerebral hemorrhage. Four patients (17%, 95%CI: 7% – 37%) had good/moderate clinical outcome (mRS: 0–3).
CONCLUSIONS
Thrombus aspiration from MCA and basilar artery is feasible and technically successful in the majority of cases where IV thrombolysis failed. Some patients require additional angioplasty to achieve recanalization. The intervention was probably performed too late to improve clinical outcome for the majority of patients. Mechanical recanalization tailored to the type of arterial occlusion may have a beneficial clinical effect if considered early.

B4:4:6

ENDOVASCULAR TREATMENT OF STROKE WITH MECHANICAL DEVICE FOR THROMBUS ASPIRATION; OUR EXPERIENCE ON 11 CASES

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PURPOSE
Mechanical revascularization of acutely occluded intracranial vessels could be an effective stroke treatment when pharmacological thrombolysis fails or when it's not indicated; furthermore, it could widen the therapeutic window. Aim of this work is to present our experience with a new device (Penumbra Stroke System, Penumbra Inc., 1351 Harbor Bay Pkwy, Alameda, CA 94502) that provides proximal approach to the occlusion site and attempts to remove thrombus by disrupting it during constant aspiration.
METHODS
We selected patients ineligible or refractory to i.v. thrombolysis up to 8 hours from symptoms onset. From December 2005 to April 2008 we used Penumbra Stroke System in 11 patients (9 males, 2 females, mean age 62,2 yrs) suffering ischemic stroke. Mean symptoms onset to treatment time was 5,5 hours, ranging from 3,5 to 7; in 1 case previous i.v. thrombolysis was ineffective. In 2 cases angiography found ICA occlusion, in 1 ICA-MCA occlusion, in 4 MCA occlusion, in 4 BA occlusion. NIHSS was recorded at presentation, after the procedure, after 24 hours and 30 days; CT scan was performed after the procedure, at 24 hours and 1 week. DSA was performed at 24 hours in 5 patients.
RESULTS
In 8 cases the procedure obtained vessel recanalization; carotid stenting was also performed in the patient with ICA-MCA occlusion. All these patients improved, with mean NIHSS score decreasing from 15 to 6. Nor device-related vessel damage, neither intracranial hemorrhagic complication were noted. In 1 case the device was ineffective, in 2 patients with very tortuous vessels it did not reach the occlusion site.
CONCLUSIONS
The Penumbra Stroke System seems to provide a relatively low traumatic approach and to be an effective device for vessel recanalization. It could be a good option, in adjunct or in alternative to thrombolysis and to other mechanical devices. Further studies are necessary.

B4:4:7

SELFEXPANDING STENTS FOR THE TREATMENT OF ICA AND MCA EMBOLISM

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PURPOSE
If intravenous fibrinolysis is contraindicated or has failed, endovascular recanalisation of middle cerebral artery (MCA) or intracranial

internal carotid artery (ICA) embolism is under investigation. Mechanical recanalisation techniques have been introduced and seem to provide better results than i.a. fibrinolysis. But aspiration and retriever devices only reach primary recanalisation rates of about 60%. Therefore stenting of the remaining thrombus was currently used with balloon expanded stents and aneursm stents with encouraging results. We applied selfexpanding arteriosclerosis stents if other recanalisation techniques failed to fix the thrombus on the vessel wall.
METHODS
We retrospectively analyzed prospectively collected material of endovascular treated embolic distal ICA and MCA occlusions. All patients treated by selfexpanding intracranial stents after failure of the Penumbra aspiration system or failure of the use of retriever devices were included. I.v. tirofiban and aspirine was used for platelet inhibition during and after stenting.
RESULTS
In eleven patients a Wingspan stent (9 patients) or Leo stent (1 patient) or Enterprise stent (1 patient) was implanted in the arterial segment, which was occluded by remaining thrombus. Occlusion sites were Carotid-T (2), M1 (7), M2 (1), M3 (1).
In all cases a TIMI (time in myocardial infarction) 2 or 3 recanalisation was achived. No procedural complication and no distal embolisation occurred. Two patients died. Six patients achieved MRS (modified Rankin scale) 0–3.
CONCLUSIONS
Selfexpanding stents seem to have the potential to savely recanalize acutely occluded intracranial arteries. Further studies have to evaluate its clinical benefit.

B4:4:8

MAGNITUDE AND DISTRIBUTION OF WALL SHEAR STRESS IN SELF-EXPANDNING INTRACRANIAL STENT: OPEN-CELL (NEUROFORM TREO) VERSUS CLOSED-CELL DESIGN (ENTERPRISE)

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PURPOSE
Stent thrombosis and in-stent restenosis are major concerns and it is likely that hemodynamic parameters such as wall shear stress (WSS) are significantly involved. The purpose of this study is to investigate the WSS in two different stent types: open-cell and closed cell design, using Computational Hemodynamics (CHD) simulations (Fluent, Inc. Lebanon, NH). These simulations included the effects of asymmetry, malapposition, and prolapse associated with real stent deployment.
MATERIALS AND METHODS
A 4×20 mmNeuroform Treo stent (NF3) (Boston Scientific, Fremon, CA) and an 4×25 mm Enterprise Stent (Cordis Endovascular, Miami Lakes, Fl) were deployed in a straight plastic tube and imaged with a MicroCT scanner (eXplore Locus SP, GE Healthcare, Milwaukee). Three-dimensional reconstructions were obtained and meshed using a segmentation algorithm Amira (Zuse Institute Berlin, Germany) and mesh generator Gambit (Fluent, Inc. Lebanon, NH).
RESULTS
Flow velocities and WSS data were obtained with emphasis on the hemodynamics near the stent struts, strut vertices, and imaging markers. Significant deviations from idealized deployment models previously studied were observed. Small recirculation zones with negative WSS were observed near malapposed and misaligned strut vertices, as well as proximal and distal to the stent markers. Prolapsed struts also permitted flow between the strut and the wall, creating larger zones of low WSS. Lower WSS was observed at the centers of the Enterprise than in the cells of the NF3.
CONCLUSION
Intra-stent flow pattern and WSS distribution is strongly influenced by stent design, strut dimensions as well as cell shape and differs significantly between the two stents tested in this study. Malapposition, misalignment and prolapse occuring more often in open cell design stents contribute significantly to the generation of low and negative WSS values. There is evidence that stents with lower profile and smaller cell size are less likely to introduce such potentially deleterious WSS zones.

B4:4:9

MIDTERM CLINICAL AND ANGIOGRAPHIC RESULTS OF MATRIX2

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PURPOSE
To evaluate one year results of Endovascular Treatment (EVT) of intracranial aneurysms using Matrix Second Generation Detachable Coils (MSG).
METHODS
Between january 2006 and december 2006, 32 patients having 32 intracranial aneurysms were treated by Coiling using MSG, with a minimum follow-up of 1 year. Data were acquired prospectively. Exclusion criteria were: Permanent Adjunctive Device, less than 50% MSG coils length, and additional bioactive or coated coils. All procedures were carried out in a single institution. Six months and one year follow up were performed with Magnetic Resonance Angriography and Digital Substraction Angiography, respectively. We assessed radiological and clinical results, using the modified Raymond classification, a 3 level Longitudinal Grading Scale (LGS), as well as Glasgow Outcome and Rankin scales. Retreatment and/or 1 year Worsening angiographic results were considered as failure.
RESULTS
Thirteen (40.6%) male and 19 (59.4%) female underwent EVT using MSG with a mean follow up of 16.6 months. Ruptured aneurysms (75%) outnumbered unruptured. Immediate radiological results showed 15 complete occlusions (46.9%), 12 (37.5%) neck remnant, and 5 (15.6%) residual sac. One year angiographic control resulted in 14 (43.8%) aneurysmal complete occlusion, 7 (21.9%) neck remnant and 11 (34.3%) residual sac. In the mean time, 6 patients (18.7%) needed to be retreated due to insufficient initial packing or early recanalization. Using the LGS, a stable occlusion was observed in 13 (50%), a progressive thrombosis in 8 (30.8%), and a Worsening result in 5 (19.2%). Thirty one patients had stable or improved clinical status, while 1 patient died from a Thromboembolic event 1 month after retreatment (3.1% overall mortality).
CONCLUSIONS
At 1 year follow-up, MSG EVT demonstrated similar angiographic results compared to Matrix First Generation and suggested that coils coated with bioabsorbable polymeric material may promote intra sacular progressive thrombosis.

B4:4:10

ENDOVASCULAR RECANALIZATION OF THE CHRONICALLY THROMBOSED INTERNAL CAROTID ARTERY. VERY PRELIMINARY RESULTS

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PURPOSE
Thrombosis and occlusion of the internal carotid artery may acutely cause brain ischemia or stroke, according to the status of the circle of Willis and collateral circulation. Some individuals tolerate an occlusion well. However, some may over time develop a symptomatic perfusion insufficiency. These patients can be treated with an arterial bypass, either from the superficial temporal artery or from the common carotid artery. Recently, endovascular recanalization of the internal carotid artery has been proposed as a treatment alternative. We here report our very preliminary results with this technique.
MATERIALS AND METHODS
The material consists of five patients with symptomatic cerebral hypoperfusion, as proven with conventional angiography and CT perfusion. All five were offered treatment. Four were subjected to endovascular recanalization of the chronically occluded internal carotid artery, responsible for the hypoperfusion.
RESULTS
One patient refused treatment and later developed a cerebral infarction and consequently died
One patient had complete, probably subintimal, recanalization of the internal carotid artery, but it was never possible to re-enter the true lumen at the level of the carotid siphon.
Three patients were successfully treated with recanalization and stenting of the internal carotid artery. On of them had a large cerebral infarction prior to treatment, had an additional infarction despite sufficient arterial flow and two days later developed a subarachnoid hemorrhage and died. The other two patients are doing clinically well. One has an progressive stenotic process in a long segment of the ICA distal to the C1 segment. One was treated recently
CONCLUSIONS
Endovascular recanalization of the chronically thrombosed internal carotid artery is technically feasible. However, the technique is still immature and further experience is necessary until we can define its place in the treatment armamentarium.

B3

16.15–17.25 - Cerebrovascular Disease II

B3:3:1

REGIONAL CEREBROVASCULAR RESERVE IN PATIENTS WITH A RECENT CEREBROVASCULAR ACCIDENT

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PURPOSE
An exhausted cerebrovascular reserve (CVR) ipsilateral to a symptomatic stenosis is a strong predictor for disabling stroke. We imaged BOLD-signal changes in reaction to apnea, determined regional CVR in recently symptomatic patients with suspected extra- or intracranial stenosis, and studied the feasibility of apnea functional MRI (fMRI) in this group of patients.
METHODS
fifty-two patients (22 females; aged 38 to 81, mean/median 62.5 y) with a recent history of TIA or stroke were examined with apnea fMRI, along with routine MRI and MRA.
RESULTS
36 patients had a stenosis in the anterior circulation, extra- and intracranial stenoses were equally distributed (n=16 each) and four of them had a tandem stenosis. Three patients had a stenosis in the posterior circulation and four patients in both the anterior and posterior circulation. The fMRI time series were preprocessed using functional imaging software (SPM5). Nine image sets had to be excluded due to motion artifacts. The statistical parameter maps of the remaining 43 datasets showed significant results in 24 cases. In seven cases apnea produced the expected positive BOLD-response in the whole brain and was judged as normal. In 17 patients a negative BOLD-response was observed and corresponded to the site of stenosis. In three patients negative BOLD-response to apnea was present bilaterally, although the stenosis was only on one side (n=2) or no stenosis was present (n=1).
CONCLUSIONS
The imaging of regional CVR using the BOLD-response to apnea is feasible in symptomatic stroke patients. Whether the region of impaired CVR represents tissue at risk has yet to be studied.

B3:3:2

STROKE MONITOR AS A DEVICE IMPROVING DIAGNOSTIC VALUE OF COMPUTED TOMOGRAPHY IN HYPERACUTE STROKE

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BACKGROUND
Stroke is the third major reason of death after cardiac and oncologic diseases. Computed tomography (CT) plays a crucial role in the evaluation of stroke patients however it is not sufficient enough in the meaning of extraction of hypodense area corresponding with cytotoxic edema in hyperacute stage. We propose additional wavelet and curvelet-based post-processing method of extraction of hypodensity in CT scans for hyperacute stroke patients.
MATERIAL AND METHODS
Retrospective evaluation of 115 sets of examinations conducted in patients admitted with symptoms suggestive of stroke was undertaken by four radiologists unaware of the final clinical findings. All of the selected cases were considered as having no direct signs of hyperacute ischemia in the localization corresponding with clinical manifestation and follow-up studies. At the first stage only the CT`s performed at the admission were evaluated, after a month the same scans were evaluated again with additional use of wavelet-based stroke monitor. Subtle tissue attenuation changes were investigated,

denoised, extracted and visualized. Follow-up CT exam and/or clinical picture confirmed or excluded the diagnosis. Basing on preliminary results and concluded efficiency limitations additional post-processing based on curvelets decomposition and improved segmentation of stroke susceptible regions has been designed and performed later on for selected examinations regarded as difficult.
RESULTS
Sensitivity of 0.641 and specificity of 0.688 were gained for the wavelet-based stroke monitor aided diagnosis. Further enhancement of hypodensity based on improved stroke monitor in diagnostically difficult cases increased sensitivity and specificity of the diagnosis. Sensitivity for 6 difficult cases increased from 0.5 to 0.91 and specificity from 0.33 to 0.76.
CONCLUSIONS
Combining the results of CT and stroke monitor provided a better diagnosis of stroke. Planned prospective studies will let evaluate the impact on further treatment of hyperacute stroke patients.

Keywords:
hyperacute stroke
CT
Wavelets
Curvelets
CAD

B3:3:3

PERFUSION COMPUTED TOMOGRAPHY AND CLINICAL STATUS OF PATIENTS WITH ACUTE ISCHEMIC STROKE

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PURPOSE
There is an increasing availability of perfusion computed tomography (PCT) for assessment of acute ischemic stroke patients. A semiquantitative evaluation of CT scans can be easily and fast performed by the examining physician. Here, we investigated the correlation between the Alberta Stroke Program Early CT Score (ASPECTS) quantifying ischemic changes on CT scans and clinical status of acute stroke patients.
METHODS
We analyzed data of 34 patients with hemispheric ischemic stroke, in whom both noncontrast CT (NCCT) and PCT were performed within 12 hours after stroke onset. NCCT and PCT (color-coded maps of cerebral blood flow [CBF], cerebral blood volume [CBV], and time-to-peak [TTP]) were evaluated using ASPECTS. The baseline neurological deficit was assessed by National Institute of Health Stroke Scale (NIHSS).
RESULTS
We found a significant correlation between the clinical status and ASPECTS for all CT modalities. The calculated Spearman's R correlation coefficient was as follows: for NCCT r=−0.46, for CBF r=-0.38, for CBV r=−0.50, for TTP r=−0.34.
CONCLUSIONS
ASPECTS used for PCT and NCCT shows a good correlation with baseline neurological deficit of acute ischemic stroke patients.

B3:3:4

INTEROBSERVER AGREEMENT IN PERFUSION CT EVALUATION IN ACUTE ISCHEMIC STROKE.

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PURPOSE
There is a growing body of evidence suggesting that semiquantitatively assessed perfusion computed tomography (PCT) may improve evaluation of acute ischemic stroke patients and provide some prognostic values. The Alberta Stroke Program Early CT Score (ASPECTS) is one of the tools to quantify ischemic changes on CT scans. While introducing PCT for routine evaluation of patients with clinical suspicion of acute stroke in our Neurology Department, we investigated the reliability of ASPECTS in analysis of noncontrast CT (NCCT) and PCT performed by neuroradiologists and stroke neurologists.
METHODS
We analyzed data of 34 patients with hemispheric ischemic stroke, in whom NCCT and PCT were performed within 12 hours after stroke onset. Two pairs of reviewers independently assessed NCCT and PCT (color-coded maps of cerebral blood flow [CBF], cerebral blood volume [CBV], and time-to-peak [TTP]) using ASPECTS. Before the scans were assessed, it was decided, based on the literature data, to dichotomize the score. The chosen cut-off points were: >=6 versus <6, >=7 versus <7 and >=8 versus <8. The agreement between readers was determined using the kappa statistics.
RESULTS
The best agreement between scan readers was achieved for PCT maps comparing with NCCT scans and when the cut-off point was >=7 versus <7. The results were as follows: for NCCT fair agreement (ê= 0.27), CBF and CBV - moderate agreement (ê=0.46 and ê=0.57, respectively),TTP - substantial agreement (ê=0.77).
CONCLUSIONS
Assessment of PCT by means of ASPECTS is a reliable tool in acute ischemic stroke patients and superior to NCCT.

B3:3:5

THE IMPACT OF HIGH B VALUE DWI IN EVALUATION OF ISCHEMIC STROKE AT 3 T MRI

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PURPOSE
Purpose of this study was to compare with high b values (3000) and standard b value (1000) diffusion weighted images (DWI) in patients with ischemic stroke.

MATERIAL AND METHODS
We analyzed 25 patients with hyperacute, acute and subacute ischemic stroke. All patients underwent routine stroke protocol including standard (b1000) DWI and high b value (b3000) DWI sequences at 3 T MR scanner (Achieva Intera, Philips). In quantitative analysis, we measured the number of lesions, signal intensities (SI), signal to noise ratio (SNR), contrast to noise ratio (CNR), contrast ratio (CR) and apparent diffusion coefficient (ADC) values in DWI with b1000 and b3000 sequences. All lesions were evaluated qualitatively regarding existence and localization of lesions, TOAST and Oxforshire classifications, time course of lesions in comparison with standard and high b value.
RESULTS
In all patients, 12 cases were classified as hyperacute, 12 cases acute and 1 case subacute respectively. On the other hand, many ischemic lesions in different periods in all patients were found during MR evaluations. In quantitative evaluation, the mean CNR of DWI obtained at high b value was lower than at standard b value ($p< 0.000048$). The mean SNR of DWI at high b value is higher than the mean SNR of DWI at standard b value ($p<0.007$) whereas the mean ADC maps were not different. Qualitatively, additional 5 ischemic lesions in high b value DWI were found in patients with hyperacute stroke in comparison with standard b value DWI.
CONCLUSIONS
All results show that high b value might be more sensitive than standard b value in comparison of hyperacute ischemic stroke. We belive that high b value DWI would contribute in diagnosis of hyperacute stroke and overcome of limitation in standart b value DWI.

B3:3:6

BRAIN MR ABNORMALITIES IN FABRY DISEASE: DATA FROM THE FABRY OUTCOME SURVEY (FOS)

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PURPOSE
Fabry disease is an X-linked lysosomial storage disorder caused by deficiency of the activity of á-galactosidase A. Fabry disease is known to be associated to stroke, particularly in the young. White matter abnormalities (WMAs), T1 hyperintensity of pulvinar and tortuous dilated intracranial vessels are commonly reported. We present the data on the frequency of these abnormalities of the Fabry Outcome Survey (FOS).
METHODS
among 1483 patients enrolled in FOS database, brain MRI of 88 Fabry patients (51 males, mean-age 41 years, range 4–71 years) were centrally analyzed. We recorded pulvinar T1 hyperintensity, ischemic lesions and vascular abnormalities; moreover, WMAs were graded as absent, 1–5, 6–10, and more than 10 or confluent lesions.
RESULTS
48 patients (26 males) had an abnormal brain MRI; 10 patients had an ischemic stroke, 2 a haemorrhage, 19 a dolichoectasia of the basilar artery. The most frequent MRI finding was the presence of WMAs which were found in 42 subjects (26 males); severe WMAs (more than 10 or confluent lesions) were detected in 32 patients (19 males and 13 females, mean age 43 and 52 years, respectively). WMAs increased in number and frequency with age but there was no difference between genders. Cardiac complications correlated with severe WMAs ($p<0.05$). Bilateral pulvinar sign was present in 13 patients (12 males, age-range 30–51 years, mean-age 43 years), 9 of whom presented severe WMAs. Male gender and severe WMAs significantly correlated with the presence of the pulvinar T1 hyperintensity ($p<0.01$).
CONCLUSIONS
WMAs are frequent in young Fabry patients, including females. The pulvinar T1 hyperintensity is commonly detected in young patients, is associated with severe WMAs but is very rare in females. The knowledge of these typical brain MRI Fabry features may be helpful in defining the cause of cryptogenic cerebrovascular events in the young.

B3:3:7

WHITE MATTER HYPERINTENSITIES OF THE CENTRUM SEMIOVALE IN DIFFUSION WEIGHTED IMAGING (DWI) WITH REDUCED APPARENT DIFFUSION COEFFICIENT (ADC): BEYOND BRAIN TERRITORIAL ISCHEMIA. A 7-YEAR EXPERIENCE

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PURPOSE
lesions in the centrum semiovale without gray matter involvement presenting reduced ADC values represent a challenging MR feature.
METHODS
we evaluated last 7-year brain MRI of our centre presenting supratentorial white matter lesions characterized by reduced ADC values. Exclusion criteria were the involvement of cortical or deep gray matter or the presence of areas of vasogenic edema.
RESULTS
we identified 10 different genetic, metabolic, iatrogenic, traumatic or vascular conditions, meeting the aforementioned criteria, namely x-linked Charcot-Marie-Tooth disease (CMTX), Menkes disease (MD), maple syrup urine disease (MSUD), glutaric aciduria type 1 (GA-1), phenylketonuria (PKU), subacute methotrexate neurotoxicity (MTXn), global cerebral anoxia (GCA), watershed ischemia (WI), diffuse axonal injury (DAI) and cerebral vasculitis (CV). CMTX disease had peculiar moose-horn lesions on coronal images with extensive corpus callosum involvement; MD showed a small oval or drop-shaped fronto-parietal lesion in each hemisphere; neonatal acute metabolic decompensation of MSUD presented a marked signal abnormality in the already myelinized brain regions, particularly along the corticospinal tract; GA-1 showed bilateral and peculiar strip-like involvement of the centrum semiovale and corpus callosum; PKU patients presented periventricular abnormalities more evident in parieto-occipital regions; during acute and subacute period of GCA we recorded signal abnormalities with a pseudo-normalization

between these phases and with a late necrotic evolution; MTXn presented almost completely reversible symmetric frontoparietal lesions; in WI chain-like lesions are found homolaterally to a severe carotid disease; in DAI we also observed a frequent involvement of corpus callosum; CV usually showed concomitant gliotic white matter lesions.
CONCLUSIONS among the lesions of the centrum semiovale with restricted diffusion concomitant MR features may help in address the diagnosis.

B3:3:8

CAROTID PATHOLOGY AND BRAIN LESION: AN ANALYSIS BY USING MULTI-DETECTOR-ROW CT ANGIOGRAPHY

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PURPOSE
Purpose of this work was to evaluate the relationship between carotid pathology, symptomaticity, and detectable brain lesion, by using MDCT. To asses the impact of stenosis degree, type of plaque, and plaque's complication as ulceration on the brain MDCT detectable lesions and symptomaticity.
MATERIAL AND METHODS
We evaluate, from January 2004 to May 2006, one-hundred-twelve patients by performing in a single session MDCT-angiography of carotid arteries and CT brain. We categorize 224 carotid aces, by evaluating stenosis degree (NASCET criteria), type of plaque and complications. The 112 CT brain were evaluate for presence, type and position of lesions.
RESULTS
We detected 55 patients with brain lesions. We observed that brain detectable lesions correlates with type of plaque besides to stenosis degree (fatty plaque versus other types $p=0.0041$; stenosis degree >70% versus stenosis degree <70% $p=0.0074$). Moreover symptomaticity also significantly correlates with fatty plaques ($p=0.0085$).
CONCLUSIONS
MDCTA allows to adequately evaluate the type of plaque other than stenosis degree. We observe a strong, statistical confirmed, correlation between cerebral lesion, symptomaticity and fatty plaque in the carotid artery. Stenosis degree also correlates with cerebral lesion and symptomaticity, but the statistical results show a weaker link. It may be useful, to include, between primary parameters in the evaluation of patients class risk, the type of carotid plaque.

Saturday - September 20, 2008 - Lecture Hall 'A'

A5
09.50–11.00 - Intracranial Tumours II

A5:5:1

EVALUATION OF LOW GRADE TUMOURS: USE OF A DYNAMIC VISUALIZATION AND A 3D VOLUMETRIC APPROACH ON FLAIR IMAGES

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PURPOSE
Low-grade astrocytomas, oligodendrogliomas and oligoastrocytoma account for 15–20% of brain gliomas. A slow growth over 10–15 years is common, leading to a final evolution into anaplastic tumour. Low-grade tumours are presently more often diagnosed at an earlier stage thanks to the high sensitivity of MRI. Prognosis and tumour volume monitoring is a challenging problem that might influence treatment. We evaluated a dynamic visualization as well as volumetric approach based on thin 3D-FLAIR acquisitions to monitor tumour growth.
MATERIALS & METHODS
The quantitative tumour volume measurements were performed on high-resolution ($0.9\times0.9\times1.5$ mm) 3D-FLAIR images using active contour segmentation. For the qualitative visual assessment of the tumour evolution, the 3D-FLAIR images from two control exams were aligned using rigid registration and displayed in overlay. Subsequently, the overlay transparency was adjusted in order to contiguously advance from display of the previous control image to the recent one, and back. In 25 patients with proven low-grade gliomas, we compared the results of this computer-aided approach with the radiologist's reports based routinely on a purely subjective and visual evaluation.
RESULTS
The quality of the image registration was confirmed by excellent superposition of gyri.
Whilst reports mentioned a globally "stable" or "mildly growing" aspect of the tumour, rigorous measurements concluded to a variable but quantifiable tumour growth varying between 6–23%. In some cases, delineation was problematic and volumetric tumour assessment hazardous. On the contrary, the dynamic approach was extremely valuable in all cases.
CONCLUSIONS
We recommend the use of a new dynamic approach of tumour growth evaluation using post-processing techniques based on a 3D-FLAIR acquisition. This approach could contribute to obtain a more accurate evaluation of growth of these slowly progressing tumours presenting with irregular and often ill-defined borders. These techniques could interfere with therapeutic management and response assessment protocols.

A5:5:2

DETECTION OF EARLY RESPONSE TO THERAPY IN GLIOBLASTOMA MULTIFORME: MULTIPLE MRI TECHNIQUE FEASIBILITY

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PURPOSE
Glioblastoma multiforme (GBM) is a genetically heterogeneous disease. Early determination of a particular therapeutic agent's efficacy would allow rapid, flexible tailoring of therapy. The ability of three advanced MRI techniques to detect early response to therapy was evaluated.
METHODS
Standard anatomical MR imaging (including T1-weighted pre- and post-gadolinium contrast), diffusion weighted imaging (DWI), and dynamic susceptibility contrast perfusion imaging was performed in five patients with GBM, both immediately before beginning treatment with the novel, molecularly-targeted chemotherapeutic agent temsirolimus, and again 7–8 days later. Volume of contrast-enhancing tumor was qualitatively compared between these two time points using a novel, automated computer algorithm for change detection. Automatically traced regions of interest (ROIs) were created for the contrast-

enhancing volumes of tumor using Analyze 7.0 software, and through image registration with DWI images, mean ADC measurements of enhancing tumor were made. Highest relative cerebral blood volume (rCBV) of tumor was determined with multiple ROI analysis. Changes in ADC and rCBV values of 10% or more were considered to be substantial.
RESULTS
Four of five patients had unequivocal decrease in volume of enhancing tumor by automated change detection. Three patients had no change in ADC (0%, 1%, 7%), one had substantial increase (18%), and one had substantial decrease (21%). One patient had substantial decrease in rCBV (11%), two had no change (9%, 9%), and two were not able to be analyzed. Direction of change among the three MRI techniques was concordant (improved and/or no change) in three patients and discordant in two. No consistent correlation with tumor time-to-progression (TTP) was identified; TTP may be dominated by the additional therapies of radiation and temozolomide.
CONCLUSIONS
Unequivocal changes in enhancing GBM tumor volume, tumor water diffusion, and tumor perfusion can be appreciated with advanced MR imaging as early as one week after initiation of chemotherapy.

A5:5:3

ARTERIAL SPIN LABELING COMPARED TO DYNAMIC SUSCEPTIBILITY CONTRAST PERFUSION MRI FOR CLINICAL EVALUATION OF BRAIN TUMOURS

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BACKGROUND
The MR perfusion sequence, pseudocontinuous (PC) Arterial Spin Labeling (ASL), with absolute quantification of cerebral blood flow (CBF) and whole brain coverage should move ASL from the research and development stage towards the clinics.
PURPOSE
The aim of this study was to compare the non-invasive ASL technique with the clinically established dynamic susceptibility contrast (DSC) perfusion MRI for evaluation of brain tumours.
MATERIAL AND METHODS: Patients: Prospective study of 26 patients with brain tumour (gliomas, meningeomas, PNET, metastases). The study was approved by the local ethics committee. MRI was performed at 3T (Signa HDx, GE Healthcare).
MRI protocol: Axial PC ASL, (GE Healthcare Applied Science Laboratory, Europe), with 3D spiral acquisition TE/TR=1.9/9.2 ms, slice thickness 5 mm, 32 slices and scan time 5 minutes. Axial DSC with GRE EPI, TE/TR=29/1400 ms, 24 slices, scan time 1.5 min and Gd-based contrast agent 0.1 mmol/kg.
Regions of interest (ROIs): Tumour ROIs were drawn in the area with apparent maximum blood flow, avoiding large vessels. Additional ROIs were positioned in normal grey and white matter and the cerebellum.
Evaluation of perfusion: Regional cerebral blood flow (rCBF) was evaluated by comparing ratios between ROIs.
RESULTS
The rCBF ratio tumour ROI/cerebellum ROI, had a correlation coefficient of 0.8, $p<0.01$ when comparing ASL with DSC. This ASL ratio was in average 0.69 of the corresponding DSC ratio, 95% CI (0.57; 0.84). rCBF ratios in normal brain tissue, measured by both sequences, showed reasonable agreement. Susceptibility artifacts were less frequent and smaller in ASL than in DSC images.
DISCUSSIONS AND CONCLUSIONS
The 3D pseudocontinuous ASL sequence with whole brain coverage provides a non-invasive alternative to DSC perfusion MRI for evaluation of brain tumors. The lower susceptibility sensitivity of ASL enables evaluation of the perfusion in tumours also close to the skull base and adjacent to postoperative cavities.

A5:5:4

DIFFERENTIATING BETWEEN TUMEFACTIVE DEMYELINATING LESIONS AND GLIOMAS BASED ON PHYSIOLOGICAL (PERMEABILITY SURFACE AREA-PRODUCT) AND HEMODYNAMIC (CEREBRAL BLOOD VOLUME) PARAMETERS USING PERFUSION CT

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BACKGROUND
Single tumefactive demyelinating lesion (TDL) may be difficult to differentiate from a high grade glioma based on morphologic MR imaging features as both can show contrast enhancement, perilesional edema, mass effect, and central necrosis. Perfusion imaging can help differentiate the two as TDLs show absence of neoangiogenesis, seen in high grade gliomas.
MATERIALS AND METHODS
Four patients with previously untreated single, heterogeneously enhancing lesions showing mild edema and mass effect underwent perfusion CT using a 64-slice CT scanner. Perfusion CT was done using a total acquisition time of 170 seconds (50 seconds cine scan +8 more axial images one image/15 seconds). Perfusion CT maps were generated using a two compartment model with perfusion 3.0 software on an Advantage windows workstation (GE). Absolute perfusion parameters i.e. cerebral blood volume (CBV), permeability surface area-product (PS), cerebral blood flow (CBF) and mean transit time (MTT) obtained from the lesion were correlated with the perfusion parameters of high grade gliomas (n=24) obtained from our previously published work (1).
All the four patients underwent stereotactic biopsy and histological examination.
Wilcoxon two sample tests were done to compare the two groups for the four CTP parameters.
RESULTS
TDL group showed significantly lower means than the high grade gliomas for CBV (1.1±0.2 vs 2.8±1.2, p-value 0.015), CBF (25.9±10.3 vs 82.0±73.7, p-value 0.020) and PS (0.7±0.3 vs 2.4±1.4, p-value 0.024). No statistically significant difference was detected between the two groups for MTT.
CONCLUSIONS
TDLs show lower CBV and PS as compared to high grade gliomas due to absence of neoangiogenesis.

REFERENCES
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A5:5:5

MULTIMODAL IMAGING OF TUMOR HETEROGENEITY IN CEREBRAL GLIOMAS

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PURPOSE
MRI is used for evaluation and therapy planning of brain gliomas. With structural MRI it is not always possible to determine a tumor's heterogeneity and grade. Additional functional imaging such as MR-spectroscopy (MRS), MR-perfusion-weighted imaging (PWI) and [18F]FET-PET enable more detailed information. However, little is known about tumor heterogeneity.
METHODS
10 patients with high grade (WHO III & IV) gliomas received structural MRI, MRS- (3D-csi, TE: 288 ms) and PWI-sequences (T2*), and [18F]FET-PET. 5 areas (MRS-voxels) were evaluated per patient and were divided into the following groups: 1. tumor areas with contrast-enhancement; 2. tumor areas without contrast-enhancement; 3. proliferation zone: edema zone with elevated regional cerebral blood volume (rCBV); 4. edema zone without elevated rCBV.
RESULTS
Contrast enhancing areas provided a mean of 6.46 (+/-4.3) for the Cho/Cr-relation and 0.86 (+/-0.66) for rCBV ($p=0.002$), non-enhancing tumor areas a mean of 4.46 (+/-2.56) for Cho/Cr relation and 1.53 (+/-0.73) for rCBV ($p=0.021$). Proliferation zones displayed a mean of 1.31 (+/-0.37) for Cho/Cr relation and a mean of 2.8 (+/-0.98) for rCBV ($p=0.012$), edema zones a mean of 1.03 (+/-0.35) for Cho/Cr relation and 0.8 (+/-0.32) for rCBV ($p=0.066$). PET showed a higher tracer absorption in tumor areas than the healthy hemisphere of 2.65 (+/-0.58).
CONCLUSIONS
Our results illustrate that high grade gliomas can be differentiated in at least 4 zones. Contrast enhancing tumor areas with higher pathological metabolite-peaks and less rCBV than tumor areas without contrast enhancement. On the other side peritumor edema zones that have to be distinguished in areas with elevated rCBV (proliferation zones) and edema zone with decreased rCBV. In conclusion our multimodal imaging concept gives for example an option to modify postoperative radiation planning in a more specific manner.

A5:5:6

IMAGING OF RATHKE'S CLEFT CYST DURING PREGNANCY

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PURPOSE
To evaluate the modifications of Rathke's cleft cysts during pregnancy.
MATERIAL AND METHODS
Four women presenting Rathke's cleft cyst (including one diagnosed during pregnancy) had a MRI of the sellar region during the last four months of pregnancy.
Examination protocols included T1 and T2 weighted images in the sagittal, coronal and axial planes. Two patients had gadolinium injection on the pre-pregnancy MRI.
RESULTS
Before pregnancy, one cyst showed a blunt T1 hypersignal, and three showed a T1 hyposignal. All had a variable signal on T2 weighted images (iso- or hypersignal).
The size were variable (four millimeters to fourteen millimeters).
In all patients, T1 signal has changed during pregnancy. The three ones with T1-hyposignal turned to T1 hypersignal. In the last one T1-hypersignal has decreased.
In three cases, the volume of the cyst showed a slight increase in volume, and in one a decrease.
CONCLUSIONS
Changes in signal and volume are frequent in Rathke's clef cysts during pregnancy.

A5:5:7

FEMALE PITUITARY SIZE DEPENDING ON CYCLE AND HORMONE-SUBSTITUTION

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PURPOSE
In neuroradiological brain diagnosis, especially in young female patients, pituitary gland is often found with borderline size. To avoid temporary "false" diagnose and thus upset a patient it is important to receive more knowledge concerning normal pituitary size variability. Still little is known about pituitary volume variations during the female cycle, the influence of taking the birth control pill or occurred birth and the onset or duration of menopause on pituitary size.
METHODS
100 women without having brain surgery in their past or history/symptoms of pituitary disease had to answer a short questionnaire concerning their cycle, menopause, hormone substitution and birth and underwent a 3T MRI (Achieva, Philips, N.V.) including a T1-weighted-sequence (TR/TE=500/10 ms) covering the region of the sella turcica. Volumes were calculaled with the software iplan cranial (Brainlab, Heimstetten).
RESULTS
Mean volumes were measured as follows: 1. Eumenorrhea: 0.949 ml (+/- 0.133), 1.a. Not taking contraceptives for more than 6 months: 0.970 ml (+/-0.135), 1.b. Taking contraceptives: 0.885 ml (+/-0.094). 2. Amenorrhoea: 0.705 ml (+/-0.141), 2.a. Women in menopause: 0.697 ml (+/-0.140) 2.b. Women with hysterectomy prior to menopause: 0.685 ml (+/-0.172), 3.a. Nulliparas: 0.795 (+/-0.191), 3.b. Uni-/multiparas: 0.873 (+/-0.182).

CONCLUSIONS
Prior studies showed that in elderly people pituitary gland height, widths and volume are less than in younger people. In our study we confirmed the bigger pituitary size in premenopausal women. Additionally we could show that women not taking contraceptives have bigger pituitary volumes than women who do and women who didn't give birth have bigger glands than women who did. Thus, this study revealed contributing factors on pituitary size worth knowing in a neuroradiologist's everyday life.

A5:5:8

3 YEAR LONGITUDINAL MRI FOLLOW-UP AND 1H SINGLE VOXEL MRS IN 20 PATIENTS WITH OLIGODENDROGLIAL TUMORS OR GLIOMATOSIS TREATED WITH TEMODAL

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PURPOSE
to better understand glial tumor metabolism and post chemotherapy variation. To determine cerebral variation in MRS area, amplitude, and ratios of metabolites and spectral profiles during a 3 year longitudinal follow-up in 20 patients with oligodendroglial tumors (12) or gliomatosis (8) treated with Temodal and to detect differences in infiltration or proliferation.
METHODS
MRI: Sagittal T1, axial proton density, T2, FLAIR, diffusion, 3D T1 3 planes after gadolinium. MRS: 1H, single voxel (6 to 12 cm3), PRESS with multiple TEs on a 1.5 T (GEMS) MRI. Data processing: SA/GE software and home-written automatic processing yielding amplitudes, areas, ratios, and relative concentrations. Statistical analysis of longitudinal spectroscopic data (every 3 months over 36 months).
RESULTS
quantitative studies in MRI with multi-spectral segmentation and tissular classification are ongoing. Without chemotherapy spectroscopic profiles worsen with increases in Choline/N-Acetyl-Aspartate (Cho/NAA), Cho/Cr and Myoinositol/Creatine (Myo/Cr) ratios, decreases in NAA/Cr and sometimes with increases in lactate. Treated tumoral volumes, in MRI, change little between two exams while spectroscopic profiles and ratios do change. MRS could, in fact, be more sensitive than MRI and could, in some cases, be predictive of worsening.
CONCLUSIONS
MRS allows non-invasive follow-up of treated cerebral tumors. There is a large variability, but repetition and modelisation of spectroscopic measurementss during longitudinal follow-up could allow us to diminish it and to improve prognostic evaluation. Studying the relationship between MRS measures, methionine PET, segmentation and perfusion parameters could lead to better understanding of therapeutic response, especially with regard to chemotherapy and antiangiogenic molecules.

A6
11.10–12.25 - Advanced MR Techniques II

A6:6:1

LOCALISATION OF THE NUCLEUS TEGMENTALIS PEDUNCULOPONTINUS WITH DTI FOR THE PLANNING OF DEEP BRAIN STIMULATOR PLACEMENT

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INTRODUCTION
Deep Brain Stimulation (DBS) involves surgically implanting electrodes into certain basal ganglia structures with precise radiological localization. Recently, there has been increasing interest in the nucleus tegmentalis pedunculopontinus (PPN) as a potential target, particularly for Dopa-unresponsive symptoms. Experimentally this is based on observations that blocking GABA and activating the PPN improves hypokinesia and axial instability in the Parkinsonian primate model. Anatomically PPN is defined by its relationship to the decussation of the superior cerebellar peduncle and the medial lemniscus. Identification of these axonal tracts via diffusion tensor imaging (DTI) may aid localization.
METHODS
Clinically, this work was motivated by a 27 year old male who developed hypokinesia and dystonia suddenly at the age of 7. Imaging (Achieva 3.0T Philips) showed bilateral cavities within the neostriatum. High resolution T2-weighted images failed to provide identification of the PPN. Single-shot, spin-echo, EPI DTI was performed and fractional anisotropy (FA) maps produced using the system manufacturer's proprietary software. The FA maps were used to identify the adjacent tracts surrounding and defining the PPN.
RESULTS
The FA maps were superimposed on the base EPI and also on high-resolution T2-weighted imaging. These images were registered with a stereotactic CT scan for electrode placement. Clinically, there has been a striking response. Oro-pharangeal function has improved dramatically and he is now able to articulate a range of words. Postural stability has improved and he can now sit independently although standing is impaired by fixed flexion deformities in the legs. Dystonic posturing is improving, the dystonic pain resolving and the leg spasms stopping.
DISCUSSION
DTI allowed delineation of the superior cerebellar decussation and the medial lemniscus and hence the PPN. Clinically and neurophysiologically, the patient has responded as predicted confirming the targeting. This is a novel clinical application for DTI in defining brainstem anatomy.

A6:6:2

DOES REPETITION TIME (TR) AND NEX AFFECT THE ACCURACY OF MR DIFFUSION WEIGHTED IMAGING?

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PURPOSE
With the extension of Diffusion Weighted Imaging (DWI) to body applications, NEX and TR had been varied in different MR scanner types. However, the effect of NEX and TR on apparent diffusion coefficient (ADC) measurements has not been investigated in detail to our knowledge. Therefore, the purpose of this study is to investigate the effects of varying NEX and TR on the accuracy of ADC measurements, which is criticial to tumor classification.
METHODS
DWI images were acquired on 3 patients using EPI DWI at 3T scanner (GE Healthcare, Milwaukee, WI). ADC values were measured over WM and GM.
RESULTS
Measured ADC values for 1 NEX was significantly higher than multi NEX exams, but, there was no significant difference between ADC values with greater than 1 NEX. On the other hand, ADC values measured using a TR of 2 and 4 sec were significantly higher when compared to a TR of 8,12 or 16 secs. No statistically significant difference ($p>0.05$) was observed between the TR of 8, 12 and 16 sec.
CONCLUSIONS
The observed results with multiple NEX and TR can be attributed to averaging effect of multiple NEX and tissue saturation effect of TR. It has been shown in this study that these two key imaging parameters should be selected carefully to obtain accurate ADC values. Considering DWI Signal to Noise Ratio (SNR), data acquisition times and accuracy of ADC measurements, we strongly recommend NEX to be between 2 and 4 and TR to be between 6 and 10 seconds for Neuro DWI exams. For body applications, NEX can be increased further to reduce artefacts and improve SNR. Standardizing imaging parameters at clinical centers with different vendors using the optimum range will be essential to the accuracy of ADC values under different clinical situation and different tissues.

A6:6:3

MAGNETIZATION TRANSFER RATIO MEASUREMENTS OF GRAY AND WHITE MATTER IN PARKINSON'S DISEASE

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PURPOSE
The aim of this study was to investigate changes in gray and white matter in patients with Parkinson's disease (PD) using magnetization transfer ratios (MTR).
METHODS
Ten PD patients without dementia ranging from 3–4 on the Hoehn and Yahr Scale and seven age-matched healthy subjects were assessed. Magnetic resonance imaging (MRI) was performed without and with magnetization transfer (MT) imaging using a PD weighted spin echo sequence. MTR was measured in 13 areas of interest (cerebellar gray matter, dentate nucleus, substantia nigra, red nucleus, pons, globus pallidus, putamen, caudate nucleus, thalamus, genu of corpus callosum, periventricular white matter, centrum semiovalis, and frontal gray matter). The mean MTR, calculated from the average of the right and left hemisphere values, was used for analysis. Measurements were performed by two neuroradiologists, blinded to the clinical status of the patients. Results for each area were compared between patients and controls.
RESULTS
The most elevated MTR values were found in the corpus callosum and the lowest values were seen in the cerebellar gray matter and caudate nuclei. In the brainstem of PD patients the most prominent decrease of MTR was found in the substantia nigra ($p<0,001$) compared with healthy controls. A significant decrease of MTR was also found in the red nucleus, pons. Lower MTR values were found in the periventricular white matter of PD patients ($p<0, 02$). The other white and gray matter regions demonstrated no significant difference.
CONCLUSIONS
MTR analysis demonstrated differences in PD patients compared to controls. This technique may be useful in assessing regional brain damage of gray and white matter in patients with Parkinson's disease.

A6:6:4

ESTIMATION OF MULTIPLE FIBER ORIENTATIONS FROM BRAIN DIFFUSION WEIGHTED IMAGES

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BACKGROUND
Diffusion weighted MR has been widely used to evaluate the white matter from the random displacements of water molecules. Post processed images, as fractional anisotropy, provide new contrast indices routinely used in clinical settings. At the same time, directions of greatest diffusion allow tracing the most likely trajectories of white matter tracts. Major limitations of this methodology are its low signal to noise ratio, low spatial resolution and the fact that not all axons inside the voxel are necessarily aligned along the same orientation. The purpose of our study is estimate more than one orientation for each voxel in crossing fibers areas.
METHOD
Diffusion-weighted data were acquired in a 1.5 T scanner by using EPI sequence, matrix size 256×256, FOV 240×240 mm2, TE 65 ms and TR 10.6 s, 32 directions and b-value of 800 s/mm2. The solution of the regularized least squares problem with non-negativity constraint was computed using standard interior-point algorithms.
RESULTS
For voxels with high anisotropy, the algorithms captured a single fiber that coincided with the principal eigenvector of the diffusion tensor

model. For voxels of moderate anisotropy, the algorithm extracted two or three fibers that show consistency between neighboring voxels and seem to pick genuine angular architecture, especially in subcortical areas.
DISCUSSION
Using this model approach, it is possible to detect white matter regions with complex fiber architecture where there is reasonable evidence of more than one fiber. The present approach seems to extract valuable information even for a small number of diffusion directions and moderate values of the b factor. The multi-fiber field could be used by probabilistic tractography techniques that consider more than one orientation per voxel.
We are working in animal models and its histopathology for compare axon directions and fiber image representation.

A6:6:5

THE HUMAN NUCLEUS ACCUMBENS - ANATOMICAL AND MRI COMPARATIVE STUDY

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PURPOSE
The Nucleus Accumbens (Acc) is a poorly known structure of the human brain. It's existence as an individualized entity is polemical. It's a component of the Basal Forebrain and the most prominent part of the Ventral Striatum, acting as a motor-limbic interface. It's involved in several emotional and psychomotor functions, frequently disturbed in neuropsychiatric disorders such as Depression, Schizophrenia, Obsessive Compulsive Disorder (OCD) and addiction behaviors. Most Acc studies were made in animals and those performed in humans are contradictory and not precise. Besides, the modern Magnetic Resonance Imaging (MRI) doesn't allow its clear identification and delimitation. Nevertheless clinical studies have revealed the benefits of its neurosurgical inactivation (Thermocoagulation or Neurostimulation) in some of those disorders. It is therefore important to study the Acc localization, to trace its precise limits and 3D coordinates, and to perform the correspondent study on MRI in order to render the Acc a safe target for stereotactic procedures.
METHODS
Anatomical and MRI (3T) coronal serial slicing of 24 Acc from human brains, perpendicular to the AC-PC line and to the midline; Acc contours tracing and measurement of its dimensions and 3D stereotactic coordinates on every slice.
RESULTS
Twenty Acc were studied by the anatomical method, 14 by MRI and 12 by both methods. The Acc was identified as a distinct brain structure only with clear-cut limits on its posterior half. The dimensions of this Acc part (mean values ± SD) are: length 10.5± 0.7 mm, width 14.5±1.6 mm, height 7.0±0.8 mm. The mean stereotactic coordinates of its borders are: Y=0 Y'=11; X=3.7 X'= 15.1; Z=2.2 Z'=−10.2. Theses 3D coordinates are applicable to MRI.
CONCLUSIONS
It was possible to identify, anatomically and by MRI, the Human Nucleus Accumbens as a distinct brain structure, to trace its limits and to establish its 3D stereotactic coordinates.

A6:6:6

DELIENATION OF DEEP PONTINE AND CEREBELLAR NUCLEI AT 3 TESLA MULTIMODAL MRI

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OBJECTIVE
Research in movement disorders, mainly in Parkinson's disease, is based on models of motor circuits containing the basal ganglia. In therapeutic basal ganglia lesioning and deep brain stimulation these models are utilized. Until recently the identification of potential targets relied on atlas based coordinates. Highfield MR imaging allows for direct visualisation of the most common targets in functional neurosurgery, but the pontine and deep cerebellar nuclei, especially the superior cerebellar peduncle nucleus and the pedunculopontine nucleus, which are used as targets in Parkinsonian animal models have not been unevocally identified in vivo imaging. Our aim is to visualize elements in the motor loops involved in many movement disorders.
METHODS
All imaging was performed at 3 Tesla Trio (Siemens Medical Solutions, Erlangen, Germany). Several different isotropic 3D Sequences on T2w basis were acquired with identical geomertric parameters for postprocessing with a house intern software. The sequences were coregistered and independent component analysis was performed in order to enhance the delineation of the nuclei. Additionally a diffusion weighted sequence with 42 directions was acquired for tractography and Q-ball imaging. A heavily suszeptibility weighted sequence was added.
All nuclei were referred to Schaltenbrand and Wahren anatomical atlas.
RESULTS
The nucleus pedunculus cerebelli superior could be identified in all subjects in the performed high resolution high contrast T2 images. The pedunculopontine nucleus was identified on the suszeptibility weighted images and in the maps acquired by multicomponent analysis. DTI and connectivity in Q-ball imaging confirmed the identification of the nuclei by their anatomical connectivity.
CONCLUSIONS
Highfield MRI is a potent method for identification of subtle anatomical structures and can be used to heighten the accuracy of targeting in animal models. Should these structures become relevant to human therapies in functional neurosurgery, these methods can be applied.

Lecture Hall 'B'

B5
11.25–12.25 - Interventional Neuroradiology: Brain II

B5:5:1

CT-GUIDED AMBULANT INFILTRATIVE TREATMENT OF BENINGE SPINE INDUCED PAIN - ATTEMPT OF POSITIONING IN DAY-TO-DAY WORK

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During the last 13 years the author noticed an steadily increasing demand of CT-guided PRT and PAT as an often last trial before operation, in postnucleotomia syndrome and in atypical pain. An easy-to-go method shall be compared to procedures of more complexity. From 2005–2008 the author recorded 1047 self-performed interventions in 206 patients with an average of 5 interventions, ranging from 1–10 infiltrations. A majority of indications where simple degenerative processes and postnucleotomia syndromes. Some extraordinary indications are discussed. The infilrations based on CT or MRI and/or clinical symptoms. Frequence, interinterventional breaks, modifications of infiltration methods were decided by the radiologist only. All interventions were performed after thoroughly desinfection, but not under sterile conditions. No pre-interventional conservative therapy trial was required. However, results improved when physical therapy was hooked in the phase of subjective remarkable pain reduction. In comparison to main studies since 1990 the author could achieve comparable to better results. Little and only slight side effects, no complications occured. The performance was quicker and of less complexity than in comparable studies. This leads to the conclusion, that this is a low-risk, fast, effective and in total easy-to-go therapy before moving into more invasive therapy forms. Even in atypic indications it seems to be worth a trial for its ease, low risk and low costs.

B5:5:2

COMBINED PERCUTANEOUS AND ENDOVASCULAR TREATMENT FOR THE SYMPTOMATIC ANEURYSMAL BONE CYST OF THE SPINE: PRESENTATION OF 3 CASES

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PURPOSE
To describe the usefulness of the combined endovascular and direct percutaneous treatment as therapy option for aneurismal bone cysts of the spine.(ABCs)
MATERIAL AND METHODS
Case reports about 3 patients with symptomatic ABCs are discussed. First patient: young male (9 ages)affected by ABC at level D9 with acute paraparesys was treated with surgical laminectomy and, as second step, with endovascular embolization with Onix and direct percutaneous injection of Glubran 2 ®. Second patient: young female (11 ages) affected by ABC at posterior arch of L5 and sacrum, treated with embolization of middle sacral artery and by percutaneous direct injection of Glubran 2®.Last patient: Male (30 ages)ABC of left lamina of L4 treated only by direct percutaneous technique with Glubran 2®. All surgical treatment were performed under general anesthesia, while local anaesthesia was performed for percutaneous treatment. An angiography control was performed in all patients, before any treatment. Angiographic results post-treatment consisted of complete exclusion of arterial supply in all cases. The amount of injected glue varies between 3 and 25 ml.
RESULTS
Combined Endovascular and percutanous treatment for the ABCs was successfully performed and led to an excellent outcome in all patients with clinical improvement. There were no periprocedural or subsequent clinical complications and the glue resulted in successful selective permanent occlusion with intralesional penetration. Direct sclerotherapy resulted in immediate thrombosis of 80% of the volume of the malformation with no progression of symptoms. At follow-up of 6 months, the symptoms had completely resolved, and CT scans showed total ossification of the lesion in all patients.
CONCLUSIONS
Combined surgical and percutaneous treatment or just direct percutaneous sclerotherapy with glue are an important, safe and effective therapy option fo symptomatic aneurismal bone cyst.

Keywords
direct percutaneous treatment
glue
aneurismal bone cyst

B5:5:3

INITIAL CLINICAL EXPERIENCE WITH RADIO-FREQUENCY BASED PERCUTANEOUS VERTEBROPLASTY (RF-PVP) IN TREATMENT OF VERTEBRAL COMPRESSION FRACTURES

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INTRODUCTION
Delivery of high viscosity cement is desirable to adequately treat fractures while limiting leakage in percutaneous treatment of vertebral compression fractures (VCF). PMMA polymerization is typically time and temperature dependent and it is the polymerization process that results in increased viscosity but limits the working time available to deliver the cement. The first clinical experience is reported using a novel PMMA delivery system, in the treatment of VCFs.
METHODS
Twenty patients were treated percutaneously under a prospective feasibility protocol for osteoporotic VCFs, ranging from T10 to L5. A Visual Analogue Scale (VAS) was used to measure pain and the Oswestry Disability Index (ODI) was used to measure functional activities pre-operatively and at post-operative time periods up to three months. The SPACE 360 Delivery System (DFine,Inc) warms with radio-frequency (RF) the low viscosity cement prior to exiting the cannula resulting in high viscosity cement being delivered to the fracture site.
RESULTS
Mean pain VAS and disability index (ODI) scores decreased significantly from pre-treatment to post-treatment in all patients: VAS (pre:7.35 - post:2.45 - 90daypost:3) and ODI (pre:55 - 90day-post:25). Cement was directed and contained in localized regions of the fractured vertebrae without the use of balloons or other fracture preparation. No vascular, extraforaminal or epidural leakage or other adverse events were observed. A small amount of cement leakage was noted in of the initial 20 cases.
DISCUSSION
A novel percutaneous PMMA delivery system has been shown to provide conventional pain relief and return to activities of daily living while delivering high viscosity cement in a controlled manner to a specific region within the vertebrae. Early clinical results suggest clinical utility of a controlled cement delivery system that appears to eliminate the need for fracture preparation prior to cement delivery while reducing the potential for cement leakage in percutaneous treatment of VCFs.

B5:5:4

THE PERI-SIGMOID HALO SIGN: REFINING CT DIAGNOSIS IN ACUTE COALESCENT OTOMASTOIDITIS.

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PURPOSE
The finding of a thin hypodense halo surrounding the sigmoid sinus on enhanced CT scan in cases of acute coalescent otomastoiditis has not been previously described. The purpose of this study was to explore the frequency and significance of this finding.
METHODS AND MATERIALS
18 enhanced CT scans of pediatric cases suffering from acute coalescent otomastoiditis were retrospectively analyzed by two readers. The peri-sigmoid region was defined and graded as being normal (grade 1), having the appearance of a smooth thin hypodense halo (grade 2), as having a small (4 mms or less) nodular component (grade 3) or being grossly (5 mms or more) nodular (grade 4). Results were compared with findings of targeted surgical exploration when these were available and with clinical follow up.
RESULTS
Small or gross nodular appearance (grades 4 and 3) was seen in 7 patients, in all targeted surgical exploration was performed and in 6 of them pus was found at the peri-sigmoid region. The smooth halo (grade 2) was seen in 7 patients of which in 4 the peri-sigmoid region was explored, and in none pus was found. In 3 cases the peri-sigmoid appearance was normal (grade 1) none of which were explored. In 1 case grading was impossible due to obscuring thrombosis. Targeted exploration revealed an abscess in this case. In all cases but one clinical outcome and follow-up were uneventful.
CONCLUSION The presence of a thin smooth halo surrounding the sigmoid sinus probably represents an inflammatory reaction but not frank pus. It is the appearance of a nodular component that points to the presence of an abscess.

B5:5:5

ULTRASONOGRAPHIC FEATURES OF FOLLICULAR VARIANT PAPILLARY THYROID CARCINOMA: MIMICKER OF A BENIGN THYROID NODULE

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PURPOSE
Although follicular variant of papillary thyroid carcinoma (FVPTC) is the most common subtype, its cytologic diagnosis is more difficult than conventional PTC. The purpose of this study is to determine ultrasonographic (US) features of FVPTC with comparison with those of conventional PTC.
METHODS
Surgically proven PTCs of 44 nodules in 40 patients with FVPTC and 74 nodules in 59 patients with conventional PTC were enrolled in this study. The following US features were evaluated: nodule size, shape, margin, echogenecity, calcification, and presence of hypoechoic halo. The incidences of the ultrasonographic malignant grade were compared between the two types, with the criteria of malignant grade if even one of the following US features was present: taller than wide shape, spiculated margin, marked hypoechogenecity, and micro- or macro- calcification
RESULTS
Ovoid to round shape (95%), smooth margin (73%), and isoechoic echogenecity (52%) were the common US features of FVPTC. The mean nodule size of FVPTC was larger than that of conventional PTC (17.70 vs. 10.53 mm, $P<.001$). Compared with conventional PTC, US features of ovoid to round shape (95% vs. 73%), isoechoic echogenecity (52% vs. 8%), and hypoechoic halo (25% vs. 3%) were more common in FVPTC ($P<.001$). US features of taller than wide shape (5% vs. 22%), spiculated margin (7% vs. 32%) and marked hypoechoic echogenecity (5% vs. 38%) were rare in FVPTC ($P<.001$). The incidences of smooth margin (73% vs. 55%), micro- or macro- calcification (45% vs. 58%) were not different in both types ($P>.05$). The incidence of ultrasonogrpahic malignant grade was significantly lower in FVPTC (48%) than conventional PTC (81%) ($P<0.001$).
CONCLUSIONS
Ovoid to round shape, isoechoic echogenecity, and smooth margin are the common US features of FVPTC. FVPTC has different US features compared with conventional PTC and may mimick a benign nodule.

B5:5:6

IMPACT OF SUPERSELECTIVE HIGH DOSE CISPLATIN INFUSION THERAPY FOR MAXILLARY CANCER WITH ORBITAL INVASION.

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PURPOSE
To evaluate the effectiveness of superselective transarterial high dose cisplatin infusion therapy for maxillary cancer with orbital invasion.
SUBJECTS AND METHODS
We have treated 23 patients with maxillary cancer using super-selective infusion therapy of high dose cisplatin and radiation concomitant therapy for ten years. Out of 23 patients, 15 showed orbital invasion and 11 tumors were fed with both internal maxillary and ophthalmic artery. In such patients, we have performed super-selective transarterial infusion therapy via only internal maxillary artery. After operation, whether the pathological complete response (pCR) or not was evaluated by checking the existence of viable cell. We also calculated the preservation rate of the eyeball, and 5-year disease free survival rate.
RESULT
In all 23 patients, pCR rate and the 5-year disease free survival rate were 95.7% and 88.2%, respectively. Till now, two patients died of lung metastasis, not local recurrence. In 15 patients with orbital invasion, the pCR rate and the 5-year disease free survival rate were

93.3% and 87.5%, respectively. All 15 patients preserved their eyeballs. Local recurrence occurred in one patient at the inferior wall of the maxillary sinus (not orbita).
CONCLUSIONS
High dose cisplatin infusion therapy remarkably improved the local control and disease free survival rate of maxillary cancer. In patients with orbital invasion, high local control rate and 100% preservation rate of the eyeball were achieved by transarterial infusion therapy via only internal maxillary artery.

B5:5:7

PRESACCAL STENOSIS AS A CAUSE OF EPIPHORA

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PURPOSE
Dacryocystographic evaluation of location of stenoses of the lacrimal pathways in patients with epiphora to define frequency and morphology of canalicular stenoses.
METHODS
DSA dacryocystograms of 55 consecutive patients with severe epiphora and stenoses of the lacrimal draining system were reviewed in consensus between three evaluators to determine radiomorphologic criteria for the diagnosis of canalicular stenosis. In 9 cases additional 3 D rotational dacryocystography was used.
RESULTS
We detected n=80 stenotic lesions, 19 (24%) canalicular, 26 (32%) saccal and 35 (44%) ductal stenoses. In nine of the patients 3 D rotational dacryocystography differentiated between canalicular (n=4) and saccal (n=5) stenosis. Increased resistance during continous injection of contrast material and lack of distension of the distal ductal system were main criteria for diagnosis of canalicular stenosis.
CONCLUSIONS
Presaccal stenoses accounted for nearly one-fourth of the stenoses found in our study; this type of stenosis occurs frequently and should not be overlooked on dacryocystography. 3 D rotational dacryocystograpy may be helpful in unclear cases.

Lecture Hall 'A'

A7
16.05–17.25 - Pediatric Neuroradiology

A7:7:1

THE SHAKEN BABY SYNDROME: HOW SENSITIZED AND INVOLVED IS NEURORADIOLOGY IN DETECTION AND PREVENTION?

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PURPOSE
Non-accidental head trauma in infants is the leading cause of infant death from injury. Particularly the Shaken Baby Syndrome as a tragic form is a complex legal situation and severe social problem. Frequently the entire facts first come to light coincidentally or retrospectively in the context of medical investigations whereas neuroradiologists can play a key role in detection. A purposeful utilization of web-based media could provide an opportunity to expand the classical diagnostic role of neuroradiologists towards a potential preventative role.
METHODS
A search for web-based media dealing with Shaken Baby Syndrome focussing on those media with neuroradiological background was performed. In the absence of any existing widespread platform we reutilized our web-based communication platform "Schoolbook" by modifying its structure and contents in terms of child abuse.
RESULTS
The search confirmed limited supply of platforms with neuroradiological emphasis especially in combination with preventative efforts. Review of current literature validated that neuroradiological imaging modalities are recognized as powerful tools in suspected non-accidental head trauma. As it is well known that neuroimaging findings are often pathbreaking in detecting signs of underlying Shaken Baby Syndrome, we demand that neuroradiologists should take a preventative task additionally to their diagnostic key role. In order to close this gap we present our first draft of a web-based platform in the field of Shaken Baby Syndrome.
CONCLUSIONS
The introduced web-based platform should combine educational aspects with a preventative initiative in order to support the detection of suspected Shaken Baby Syndrome and to promote its prevention.

A7:7:2

WHITE MATTER INVOLVEMENT IN GALACTOSEMIA (GAL): A DIFFUSION WEIGHTED IMAGING STUDY

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PURPOSE
Galactosemia (GAL) is an autosomal recessive condition in which there is marked reduction of the activity of galactose-1-phosphate uridyltrasferase. Despite early dietary theraphy, many patients with GAL show a neurodegenerative disease specially evident in speech impairment and movement disorders.
METHODS
We reviewed the brain MRI performed in 7 GAL patients older than 6 years in order to avoid sedation and to have a nearly completed myelination (3 male; median age 14 yrs: range 11–23 yrs). On a 1.0T scanner (Marconi Picker), T1, T2, DP, FLAIR and DWI sequences were performed. Apparent diffusion coefficient (ADC) values were measured in prefrontal, parieto-occipital and rolandic white matter

(WM) areas and within focal WM lesions, whenever found. In all patients the mutation was determined.
RESULTS
We observed three different brain MR patterns: 2 patients had normal brain MRI (Duarte and Los Angeles type, both mild mutations); 5 patients presented diffuse WM T2 hyperintensity with U-fiber involvement and sparing of Rolandic area and optic radiation (classical galactosemic mutations Q188R, S135L, K285N, L195P, Y209C, F171S); one patient presented additional numerous focal supratentorial WM lesions. Frontal and parieto-occipital regions had higher ADC values compared to the Rolandic region ($p<0.05$). Focal lesions had significantly higher ADC values than both frontal-parieto-occipital or Rolandic areas ($p<0.01$). Follow-up MRI was available in 4 patients and showed no lesion progression.
CONCLUSIONS
The white matter of GAL patients may show different degree of involvement. The ADC increase in the affected areas is consistent with impaired myelination and correlate with the severity of enzyme deficiency.

A7:7:3

BRAIN MRI IN GLUTARIC ACIDURIA TYPE I (GA-I): NEW FINDINGS WITH DIFFUSION WEIGHTED IMAGING (DWI)

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PURPOSE
GA-I is characterised by peculiar neuroradiological findings including subdural haematomas, widened Sylvian fissures, frontotemporal hypoplasia, basal ganglia lesions and white matter (WM) hyperintensity. We report new neuroradiological findings observed in 3 GA-I patients.
METHODS
Five patients (3 unrelated families, 2 males, range 6–25 yrs) were diagnosed with GA-I in our Metabolic Unit in the past 13 years. Three of them were diagnosed after an acute encephalopatic episode and progressively developed extrapyramidal brain symptoms. The two remaining patients were asymptomatic (diagnosed after a familiar screening). No further episodes of metabolic decompensation were reported.
RESULTS
All patients underwent brain MR imaging in several occasions with a mean follow-up of 4 years. T1w, T2w, FLAIR and DWI sequences were performed and ADC values where measured within lesions. Apart from the usual MRI findings already reported in GA-I we detected a T2 hyperintensity of the fornix and the medial part of the genu of corpus callosum, with peculiar strip-like sparing of its lateral part, in 2 unrelated symptomatic patients and in an asymptomatic one. In the younger patient this pattern was less evident but progressed in repeat MRIs. Furthermore all WM lesions showed a marked DWI hyperintensity with significantly reduced ADC values which persisted in the follow-up MR scans. Finally 1 patient presented a thalamic bilateral involvement, 1 presented a cavernous angioma, and 1 presented subependimal cysts.
CONCLUSIONS
GA-I patients may have highly variable MR findings. In particular we describe a peculiar strip-like involvement of the corpus callosum which was never reported before in GA-I. Moreover, DWI images show a characteristic signal pattern within WM lesions which might slowly worsen, despite the absence of acute crisis or metabolic decompensation. Finally, since ADC reduction persisted over time this feature is not consistent with acute cytotoxic edema.

A7:7:4

BRAIN MAGNETIC RESONANCE FINDINGS IN SYMPTOMATIC CONGENITAL CYTOMEGALOVIRUS INFECTION

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PURPOSE
Congenital cytomegalovirus (CMV) infection is the most common intrauterine infection in developed countries and can lead to severe neurological sequelae and sensorineural hearing loss (SNHL). The purpose of the study was to define a brain magnetic resonance imaging (MRI) pattern of this congenital infection whose diagnosis can not be easily confirmed after the neonatal period.
METHODS
The clinical findings and MR images of children with symptomatic documented congenital CMV infection followed at the Department of Pediatrics between 1994 and 2007 were retrospectively reviewed. MRI examinations were performed using 1.0T and 1.5T scanner.
RESULTS
Nineteen MR examinations were performed in 14 of 17 children with congenital CMV infection. Microcephaly, cerebral palsy and epilepsy were found in 8, 6 and 7 out of the 14 patients respectively; in 6 cases all these findings were concomitant. Twelve children developed SNHL, 4 in the absence of other neurologic sequelae. At the time of the first MRI, the patients' age ranged between 4 and 54 months (mean-age 19 months). White matter abnormalities (WMA) were recorded in 12 patients; all had frontal and temporal deep white matter involvement, 11 had also parietal and occipital involvement and 11 presented periventricular and iuxta-cortical WMA. Six children underwent MRI examination after 2 years of life: in this subgroup WMA were extensive and confluent (4/6), bilateral and multifocal (1/6) or absent (1/6). Four children had more than one MRI examination and all showed a progression in the myelination process. Other significant and frequent MR findings were: ventriculomegaly (9/14), migration disorders (6/14 polimicrogyria and 1/14 pachygyria-lissencephaly), hyppocampal dysplasia (6/14), periventricular cysts (5/14) and cerebellar hypoplasia (4/14).
CONCLUSIONS
Extensive and confluent supratentorial deep white matter abnormalities and neuronal migration disorders might suggest congenital CMV infection in children not tested within the appropriate time frame of 3 weeks after birth.

A7:7:5

LONG-TERM MANAGEMENT IN THE CLASSICAL FORM OF PKU: CAN BRAIN MR DIFFUSION WEIGHTED IMAGING BE A GUIDING LIGHT?

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PURPOSES
to grade semiquantitatively white matter abnormalities (WMAs) on MRI of classical phenylketonuria (cPKU) patients treated from birth with strict diet, and to compare sensitivity and specificity of T2-weighted and diffusion-weighted (DWI) images.
METHODS
20 early-treated cPKU patients still on diet (12 males; mean-age 21.2 years) and 26 normal subjects (10 males; mean-age 25.1 years) were enrolled. Typical T2 and diffusion weighted WMAs were semiquantitatively graded according to Thompson score (TS). Moreover, a regional MRI score (mTS) was developed, considering extension and intensity of WMAs. Phenylalanine and tyrosine plasmatic concentrations before MRI and their mean levels in the year before MRI (Pheyear) were measured. Results: No patient younger than 14 years or with Pheyear concentration below 461 ìmol/L showed WMAs. In cPKU patients, TS and mTS were significantly higher on DWI than on T2 images (3.50 vs 2.65 and 23.65 vs 15.85 respectively, $p<0.002$, Wilcoxon test). All controls were scored 0 on DWI, while T2 TS and mTS were 0.19 and 1.70. DWI evaluated by mTS disclosed a fronto-temporal, occipital and parietal WM progressive involvement. TS and mTS, on both T2 images and DWI, showed no correlation with tyrosine, a strong correlation with phenylalaninemia and an optimal correlation with Pheyear levels.
CONCLUSIONS
Among the different MR sequences, DWI seems to be the most sensitive and reliable in detecting and grading the characteristic WMAs in cPKU patients, who have high blood Phe concentrations even after strict dietary control early in life.

A7:7:6

PRENATAL MAGNETIC RESONANCE IMAGING (MRI) AND ITS INFLUENCE ON MENINGOCELE INTRAUTERINE SURGERY QUALIFICATION.

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INTRODUCTION
The development of diagnostic methods has contributed greatly to the current interest of neurosurgeons in performing intrauterine surgery of congenital defects, like dysraphia coexisting with hydrocephalus. The aim of this study is to compare the value of ultrasound (US) and MRI for planning prenatal neurosurgical procedures.
MATERIAL AND METHODS
125 prenatal US and MRI were performed in suspicion of the fetal congenital CNS defect. Fetal age was from 16 to 40 weeks. MRI was performed with 1.5T MR system, torso coil, SSFSET2 sequence, 4 mm or 8 mm thickness slices. MR images were compared to the US collected in the same period of time. The final verification was established after birth via a physical examination.
RESULTS
46 out of 125 fetuses with CSN abnormalities were diagnosed as meningocele or meningomyelocele in accordance to MRI. Intrauterine surgery was performed in 11 cases. Following inclusion criteria were applied: gestational age below 27 weeks, absence of other congenital malformations, and lateral ventricular size below 17 mm, Arnold-Chiari II malformation, lower limbs movements, and absence of talipes deformity. MRI were fundamental in decision to disqualify from neurosurgery in 7 cases and to qualify in 7 cases. These cases were misdiagnosed during ultrasonography.
CONCLUSIONS
MRI is significantly superior to sonography in the evaluation of spinal canal and posterior fossa abnormalities and more helpful for making a final decision about the appropriate timing and type of surgical intervention than US. MR imaging can be a basis for surgery qualification and for monitoring the postoperative condition of the fetus.

A7:7:7

FETAL MR IMAGING AND ITS INFLUENCE ON PROGNOSIS AND THERAPY USED IN CASES WITH CENTRAL NERVOUS SYSTEM DEFECTS IN COMPARISON TO PRENATAL ULTRASOUND.

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INTRODUCTION
The aim of this study was to compare a diagnostic and prognostic value of prenatal ultrasonography and MRI of fetuses with central nervous system defects and to evaluate the influence of fetal MRI on final therapeutic decisions.
MATERIAL AND METHODS
125 pregnant women suspected for fetus CSN defects underwent US and MRI. Fetal age was from 16– 40 weeks. US were performed using Voluzon-Kretz 730PRO. MRI was conducted with 1.5T Excite system, torso coil, SSFSET2 sequences, 4–8 mm thickness slices in orthogonal planes. MR images were compared to prenatal ultrasonographic ones.

The influence of prenatal MRI on making the following decisions was evaluated: whether a child should be delivered earlier than expected, in what way the pregnancy should be ended, and whether any neurosurgical procedures should be performed urgently after delivery.
RESULTS
6 out of 125 newborns with congenital CNS defects died after delivery, 67 were verified with physical examinations, there are no data about the others. Diagnoses made with ultrasonographic equipment were improved by MR imaging in every case. In 28 cases [22.4%] misdiagnoses done with ultrasongraphic method were corrected with MR imaging. In 61 cases [48.8%] the prognosis or the treatment after delivery were changed because of MR findings.
CONCLUSIONS
Comparing prenatal MR and ultrasonographic imaging used in diagnoses of CNS defects, the MR images significantly increase the quantity of data helpful to establish a prognosis and the appropriate treatment. They also help to monitor child's condition in order to plan gynecological, neonatal and neurosurgical care.

Lecture Hall 'B'

B7
15.00–16.10 - Interventional Neuroradiology: Brain III

B7:7:1

ENDOVASCULAR TREATMENT ONLY WITH INTRACRANIAL SELF-EXPANDABLE STENT FOR UNRUPTURED SYMPTOMATIC CEREBRAL CAROTID ANEURYSM: PRESENTATION OF TWO CASES WITH SHORT-TERM FOLLOW-UP

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PURPOSE
To illustrate the usefulness of intracranial stent for the treatment of symptomatic unruptured carotid cerebral aneurysm
MATERIAL AND METHODS
2 patients (M.62 age;F.55age) with left progressive ophtalmoplegia were evaluated with MR and angio MR. MR revealed the presence of two intracavernous aneurysms: one sacciform with wide-necked "ring-form", partially thrombosed, unruptured aneurysm, and the other one affected by fusiform unruptured aneurysm. Both aneurysms were located on the carotid siphon. Under general anesthesia,the sacciform aneurysm was treated with intracranial self-expandable stent.The fusiform aneurysm was treated with double self-expanded stent-intra-stent technique.Patient were previously prepared with Plavix and ASA for 5 days before treatment. For both patients, post-intervention medical therapy was high dose at scale of steroids for 3 weeks and Plavix plus ASA just for 2 months.
RESULTS
Endovascular Treatment (EVT) was successfully performed and led to an excellent outcome in all patients with clinical improvement. The stent could be navigated within cerebral arteries without any exchange procedure. Thanks to its retractability, the stent could precisely be positioned in all cases. Angiographic results consisted of partially aneurysm occlusion in both cases but with angiographic evidence of persistence of contrast media in the sac suggesting a late occlusion. No peri-procedure complications occurred. In the follow-up after 3 months, the clinical results were always stables with increased of sac thrombozed.
CONCLUSIONS
EVT with intracranial self-expandable stent without coiling for unruptured but symptomatic cerebral aneurysm of the syphon is good, safe, usefulness procedure without major or minor complication. The advantage of those new stents is the simplicity of the navigation and deploy, the possibility to reposition it which allows a very precise positioning across the aneurysm.

Keywords
endovascular treatment
unruptured aneurysm
intracranial stent

B7:7:2

PATIENTS PRONE TO RECURRENCE AFTER ENDOVASCULAR TREATMENT: THE PRET TRIAL

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BACKGROUND AND PURPOSE
Endovascular treatment of aneurysms is associated with a significant number of angiographic recurrences. Studies showed that large (>10 mm) aneurysms and recurrent aneurysms may be associated with more than 50% rate of recurrence or further recurrence. These aneurysms are generally not included in clinical trials. HELPS study recruited a large proportion of small aneurysms so that the benefit of hydrocoils may be masked. PRET trial aims at aneurysms especially prone to recurrence where the recurrence rate will be compared between bare coils and hydrocoils.
PRIMARY HYPOTHESIS
The use of hydrogel-coated coils in patients with large aneurysms or presenting major recurrences after a previous treatment decreases the recurrence rate from 50 to 32% at 18 months as compared to bare platinum coils.
SECONDARY HYPOTHESIS
The number of adverse events is similar for both groups. Morbidity and mortality related to treatment remains unchanged.
DESIGN
randomized, multi-centre, prospective, controlled trial comparing hydrogel-coated coils to standard platinum coils. Adjudication of angiographic results performed by a committee blinded to treatment allocation in an independent core laboratory. All patients with an intracranial aneurysm >10 mm (PRET-1 lesions) or with a major recurrence after previous coiling (PRET-2 lesion), eligible for endovascular treatment, will be proposed to participate. The study will be conducted in 23–40 centers. Pilot phase has already begun in our center with 12 patients randomized. Aim of approximately 500 patients equally divided between the two groups. Study duration of five years; three years for patient recruitment plus 18 months of follow-up. Angiographic assessment performed at 6 and 18 months. Clinical assessment at 1, 6 and 18 months will search specifically for inflammatory syndromes that have been associated with hydrocoils.
CONCLUSIONS
PRET study may show a benefit for a subgroup of aneurysms prone to recurrence that generally escape clinical trials.

B7:7:3

ENDOVASCULAR TREATMENT OF EXTRACRANIAL CAROTID AND VERTEBRAL PSEUDOANEURYSMS WITH COVERED STENTS

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PURPOSE
Although some pseudoaneurysms tend to heal in a spontaneous way, reestablishing the arterial lumen, others persist through time with the risk of haemorrhage, vessel occlusion or other complications such as thromboembolic phenomena. The endovascular treatment of these aneurysms often involves the use of open stents followed by coiling. The results obtained with this technique are not always satisfactory. Covered stent grafts are currently used for the successful treatment of aneurysms and pseudoaneurysms in the aorta, iliac arteries, and femoral arteries. Recently some cases have been reported on the use of these stents in head and neck neurovascular lesions. We describe our experience in treating carotid and vertebral pseudoaneurysms with covered stents - Jostent® - Abbott.
METHODS
Three patients were treated to four pseudoaneurysms: two in the extracranial internal carotid artery and two in the vertebral artery using 4 Jostents® - Abbott. All of them were premedicated with Aspirin and Clopidogrel and submitted to anticoagulation with heparin and intraarterial nimodipine during the procedure. They remained on double antiplatelet therapy for three months followed by monotherapy.
RESULTS
It was possible in all cases to obtain an adequate deployment of the stent with the consequent immediate exclusion of the pseudoaneurysm and reestablishment of the vessel lumen. There was no morbility or mortality.
CONCLUSION
In this small series, the use of covered stents allowed safe and effective treatment of pseudoaneurysms occurring in the extracranial segments of the carotid and vertebral arteries. However a larger series of patients with a longer period of follow up will be necessary to draw more definitive conclusions.

B7:7:4

A NEW TECHNICAL APPROACH TO COAXIAL CATHETERIZATION

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The coaxial microcatheter system is often limited by guiding catheter instability. This may be due to the type of catheter, but instability is more often caused by anatomical features such as aortic arch dilation, general vessel tortuosity, arterial wall fragility, etc. The main technical variant adopted to attenuate instability is the 6F 90 cm long sheath catheter which can also contain a 6F guiding catheter providing a good degree of microcatheter support.
After many years of asking catheter manufacturers to produce a 4F long sheath, Balt has finally come up with a new device. The Balt 4F long sheath can carry a Vasco35 type guiding catheter providing a good degree of microcatheter support and the advantage of a 2.1 mm of external diameter injection port as opposed to the 2,7 mm port of the 6F device. Plainly tri-axial catheterization is also possible with the 6F long sheath catheter with the added benefits of better angiographic possibilities and road mapping.
We describe our use of the 4F long sheath device describing the technical details, advantages and limitations of the new approach.

B7:7:5

ONYX EMBOLIZATION OF CEREBRAL ARTERIOVENOUS MALFORMATIONS WITH A CURATIVE INTENT IN 101 PATIENTS

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PURPOSE
To present our experience with Onyx in the curative embolization of brain AVMs.
METHODS
We retrospectively reviewed the files of all our patients that we treated with Onyx embolization for a brain AVM in the last four years. We identified 101 patients who were submitted to 219 sessions of embolization.
RESULTS
The treatment has been concluded in 52 patients and more embolization sessions are to be performed in 49 patients. Total occlusion has been achieved in 28/52 (53.9%) and near total in 18/52 (34.6%). There were 3 deaths and 8 patients had permanent neurological deficits with a resulting morbidity of 8% and mortality 3%.
CONCLUSIONS
High rates of total or near-total occlusion of brain AVMs can be achieved with multiple sessions of Onyx embolization with acceptable morbidity and mortality

B7:7:6

TREATMENT OF INTRA-OPERATIVE STENT THROMBOSIS WITH LOCAL INTRA-ARTERIAL ADMINISTRATION OF EPTIFIBATIDE

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PURPOSE
To present our experience with the intra-arterial administration of eptifibatide in the treatment of intra-operative stent thrombosis during aneurysm embolization.
MATERIAL
In 6 out of 157 cases of stent assisted aneurysm embolization, thrombus formed inside the stent leading to partial or total vessel occlusion. We administered eptifibatide with a micro-catheter directly on the thrombus in doses ranging from 7.5 g to 15 mg.
RESULTS
In all cases the thrombus was dissolved in 10–15 minutes without recurrent thrombosis. No patient had any hemorrhagic complication or exhibited any new neurological symptomatology.

CONCLUSIONS
Bolus intra-arterial eptifibatide can aid in the treatment of intra-operative stent thrombosis.

B7:7:7

COIL EMBOLIZATION OF CAVERNOUS SINUS IN PATIENTS WITH DIRECT AND DURAL AVF

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PURPOSE
To determine technical success and acute complication rates after endovascular coil packing of the cavernous sinus.
METHODS
Between 2001 and 2008 n=19 consecutive patients presented with either direct (n=13) or dural (n=5; one patient had bilateral dural fistulas) AVF and were treated by means of transvenous or trans-arterial coiling of the cavernous sinus. The aim of treatment was complete obliteration of the fistula including all connections to cortical or orbital venous drainage. In a retrospective study we evaluated the degree of obliteration and regression of symptoms of the AVF as well as technical and clinical complication rates in the acute phase up to 30 days after the procedure.
RESULTS
Complete obliteration was achieved in 16 out of 19 cases, subtotal occlusion of the sinus in 3 and incomplete packing with major residual fistula in none of the patients. Retreatment was successfully performed in two patients with early recurrences of traumatic CCF. Ocular symptoms like chemosis and exophthalmus regressed rapidly in 16 out 19. patients. Persistence of cranial nerve deficits (oculomotor functions, visual loss) was observed in 12 cases. Postinterventional thrombosis of the ophthalmic vein was the only major acute complication (n=2).
CONCLUSIONS
Coil embolization of the cavernous sinus in cases with AVF is a complex procedure which is technically feasible in the majority of cases. Adequate anticoagulation is mandatory to avoid thrombembolic complications. Long term outcome has to be determined by further studies.

B7:7:8

TREATMENT OF BRAIN AVM BY ONYX: RESULTS FROM A SINGLE CENTER

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PURPOSE
Appreciate the treatment results of brain AVM embolisation with ONYX versus Glubran in a single center.
METHODS
Sixty five patients presenting a brain AVM have been embolised in our service from January 2003 to December 2007. Sixteen were treated by Onyx alone, twenty by both Onyx and Glubran and the remaining twenty nine by Glubran alone. All patients were symptomatic, presenting either with epilepsy, stroke or intra-cranial hematoma.
RESULTS

- For the 16 patients treated by Onyx alone, we obtained complete exclusion of the brain AVM in 12 and partial exclusion in 4.
- For the 20 patients treated by both Onyx and Glubran, we observed 9 complete exclusions and 11 partial ones.
- For the 29 patients treated by Glubran alone, we had 14 complete exclusions and 15 partial.

Although the rate of complete exclusion was clearly superior in the Onyx-alone-group, we had 2 post-embolisation hematomas and one TIA in this group, as compared to olny one TIA in the Glubran-alone-group.
CONCLUSIONS
Even if today Onyx has proved its efficacy in the treatment of brain AVM, the rate of complication in our series is still more important than in the Glubran treatment group.

B7:7:9

ENDOVASCULAR TREATMENT OF BRAIN AVMS USING ONYX: PRELIMINARY RESULTS OF BRAVO SERIES

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PURPOSE
To evaluate the safety and the efficacy of Onyx in the endovascular treatment of brain arteriovenous malformations (AVMs) in a prospective, European, multicentric series (BRAVO).
METHODS
BRAVO is a European, prospective, multicenter series conducted in 12 centers in 5 European countries. Patients are consecutively enrolled on an intention-to-treat basis. The final goal is to include 100 patients. Clinical and anatomical results are evaluated by an independant core lab.
From May 2006 to April 2008, 84 patients were enrolled (Females: 38, Males: 46; mean age: 41 years). Clinical presentation was

intracranial hemorrhage (28%), epilepsia (40%), progressive neurological deficit (11%), and other (23%). Anatomical characteristics of brain AVMs were analyzed in 75 cases. Associated aneurysm was present in 25% of cases, and direct fistulas in 43% of cases. AVMs were located in the cerebral hemispheres (67 cases), in the corpus callosum (3 cases), in the basal ganglia (2 cases) and in the cerebellum (3 cases).
RESULTS
Modalities of treatment, adverse events, and clinical complications are analyzed.
The final degree of occlusion and the complementary treatments, when needed, are described.
CONCLUSIONS
The preliminary results of the first prospective, multicenter, European series dealing with the endovascular treatment of AVMs with Onyx are presented and will be analyzed in light of the literature.

B7:7:10

TRANSVENOUS EMBOLIZATION OF TYPE IIB DURAL ARTERIOVENOUS FISTULAS: REPORT OF 3 CASES

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PURPOSE
To show the feasibility of complete transvenous embolization of type IIb (according to the classification of Gognard) dural arteriovenous fistulas after endovascular recanalisation of an occluded venous segment.
METHODS
We report on three consecutive cases with type IIb fistulas. All presented clinically with sequelae of venous congestion: One patient was admitted in a seizure state due to edema, one suffered from increasing confusion and mental deterioration and one presented with a temporal lobe bleeding. In all three cases we chose a transvenous approach through the internal jugular vein using a transfemoral access. After placement of a guiding catheter below the jugular foramen, it was possible to reach the isolated segment of the transverse sinus following recanalisation of the occluded segment with a thin microcatheter in all three patients.
RESULTS
Deployment of fibered and non-fibered free and detachable coils resulted in a complete and permanent occlusion of the isolated sinus segment with a consecutive complete cure of the fistula. Following the intervention, all patients were put under full heparinization for 1 week to prevent retrograde thrombus propagation through pial veins. All patients recovered clinically. No complication, procedural or post-procedural, occurred.
CONCLUSIONS
Type IIb fistulas bear a high risk of neurological complications due to venous congestion. They require complete transvenous embolization. Therefore, attempts to reach the venous arm of the fistula through occluded segments of a sinus are a worthwhile strategy.

B6
16.15–17.25 - Cerebrovascular Disease III

B6:6:1

COMPUTER-AIDED, ATLAS-ASSISTED PROCESSING AND QUANTIFICATION OF CT AND MR SCANS IN STROKE

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Computerized tomography and magnetic resonance imaging play a central role in making diagnosis and therapeutic decision in stroke. The current practice is to process multiple scans and maps individually by visual inspection which is time consuming and not quantitative. Quantitative tools for image segmentation and analysis, quantification of various conditions, and three-dimensional visualization facilitate and speed up stroke data analysis.
We have been developing a suite of computer-aided systems supporting stroke prognosis, diagnosis and treatment. This work addresses rapid and automatic detection, diagnosis and quantification of stroke images assisted by brain atlases of anatomy and blood supply territories (BSTs).
A Computer-Aided Detection (CAD) system in the Emergency Room (ER) supports rapid and automatic localization analysis and decision making. Conditions are formulated to classify normal/pathological scan, ischemic/hemorrhagic stroke, and new/old infarct. This CAD analyzes statistically the differences between the left and right hemispheres in multiple regions delineated by the atlases mapped rapidly on the scan.
The CAD system for acute ischemic stroke enables the decision to proceed with thrombolysis to be made quantitatively. The infarct and penumbra are segmented by a combined automatic-interactive approach and the diffusion-perfusion mismatch is measured and displayed in three dimensions. This CAD calculates: 1) names of all anatomical structures and BSTs within the infarct and penumbra, 2) volume of occupancy for each structure/territory, and 3) percentage of occupancy for each structure/territory, including the infarct-middle cerebral artery ratio.
Our stroke systems potentially facilitate and speed up image analysis, increase confidence of interpreters, and support decision making. Their automatic and quantitative capabilities may also make them useful tools for assessing outcome for individual patients and clinical trials. They are useful in the ER, where non-neuroradiologists (emergency physicians, fellows, residents) may be reading stroke scans, thereby enabling shortening of the waiting time to start managing stroke detected cases.

B6:6:2

CEREBRAL VASCULATURE IN THREE DIMENSIONS AND ITS CORRELATION WITH IMAGING NEUROANATOMY BASED ON 3T AND 7T ACQUISITIONS

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Presentation of vasculature in three dimensions (3D) with its correlation to imaging neuroanatomy greatly facilitates learning and understanding of vasculature. High field scanning (3 tesla (T) and 7T) provides more detailed depiction of anatomy and vasculature comparing to 1.5T acquisitions.
A healthy subject was scanned on 1.5T, 3T and 7T scanners. Magnetic resonance imaging (MRI) and magnetic resonance angiography (MRA) volumetric scans were acquired.
A 3D cerebrovascular model derived from 3T MRA was constructed with the arterial and venous systems placed in the reference coordinate system. The vessels were extracted and labeled with names and diameters. Very small vessels were reconstructed interactively using a dedicated vascular editor. This 3D reference model was correlated with 3T MRI and MRA scans on the axial/coronal/sagittal triplanar. Subsequently, the cerebrovascular model is extended with 3D cerebrovascular variants. Finally, the model is enhanced and expanded with 7T MRA. A user friendly navigator for manipulation of the 3D cerebrovascular model along with the scan triplanar is developed. It provides vessel selection, highlighting, labeling and measurements. It enables selection and display of cerebrovascular variants.
This model with its navigator has many advantages. It correlates 3D angiography with 2D neuroanatomy on axial, coronal and sagittal planes displayed simultaneously. It provides real-time manipulation of the cerebrovascular model with the scan triplanar. It enables comparison of 3T and 7T acquisitions in terms of 3D cerebrovascular models and neuroanatomy. It provides localization and quantification (vessel diameter, coordinates, distances). It enhances understanding of 3D cerebrovasculature. 3D vascular models with navigators have a great usefulness in education. The model/navigator enables the student to quickly grasp the 3D cerebrovascular anatomy and helps the educator in preparing teaching materials. It may be useful in medical research, serving as reference cerebrovascular atlas. It also may assists in diagnosis and treatment by providing quantification and cerebrovascular variants.

B6:6:3

4D IMAGING IN CEREBROVASCULAR INSUFFICIENCY BY USING 320-SLICE CT

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Aim of this study was to report initial experience with a 320-slice CT scanner in assessing patients with cerebrovascular (cv) disorders.
26 patients with clinical signs of acute and/or chronic cv insufficiency underwent 320-slice CT.
Single-rotation CT of the head, incremental CT angiography (3D CTA) as well as 4D whole-brain CTA (4D CTA) and whole-brain CT Perfusion (CTP) were performed and assessed for image quality in comparison to 64-slice CT protocols.
320-slice CT neuroimaging could be performed in all cases.
Inferior image quality was noted for the 320-slice protocols of the head CT and the 3D CTA compared to the 64-slice protocols.
Image quality of the 4D 320-slice CTA was rated inferior compared to both 320- and 64-slice 3D CTA.
4D CTA-CTP imaging provided dynamic angiographic and brain perfusion informations with pivotal clinical implications.
We conclude that 320-slice CT neuroimaging is a feasible method that permits whole-brain 4D imaging with promising potential regarding pathologies with altered hemodynamics. However, image quality limitations are a drawback at present.

B6:6:4

FOLLOW-UP OF INTRACRANIAL ANEURYSMS TREATED WITH DETACHABLE COILS: COMPARISON OF 3D INFLOW MRA AT 3T AND 1.5T AND CONTRAST-ENHANCED MRA AT 3T WITH DSA

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INTRODUCTION
The purpose of this prospective study was to compare 3T and 1.5T magnetic resonance angiography (MRA) with digital subtraction angiography (DSA) for the follow-up of endovascular treated intracranial aneurysms to assess the grade of occlusion.
METHODS
Thirty-seven patients with 41 aneurysms who had undergone endovascular treatment with detachable coils were included. MRA were performed on the same day using an eight-channel sensitivity encoding head-coil with 3D axial inflow technique. At 3T, a contrast-enhanced transverse 3D fast gradient echo acquisition was also performed. Most patients underwent DSA the following day. MRA scans and DSA were classified first independently by two neuroradiologists and an interventional neuroradiologist. Secondly, a consensus was done. Source images, maximum intensity projection (MIP), multiplanar reconstruction (MPR) and volume rendering reconstructions were used for MRA evaluations. A modification of the Raymond classification, previously used for DSA evaluation of recanalization, was used.
RESULTS
Statistical comparison of the consensus showed that 3T MRA with 3D axial inflow technique had better agreement with DSA (ê=

0.43) than 1.5T MRA(ê=0.21) and contrast-enhanced MRA (CE-MRA) at 3T (ê=0.17). The susceptibility artefacts from the coil mesh were significally smaller at 3T (p=0.002 – 0.007) than at 1.5T, probably due to higher band-width and shorter TE used at 3T in our study.
CONCLUSION
3T MRA, using a sensitivity encoding head-coil, showed better agreement with DSA than 1.5T and CE- MRA at 3T for evaluation of aneurysms treated with endovascular coiling.

B6:6:5

HEMORRHAGE RISK IN BRAIN ARTERIOVENOUS MALFORMATIONS (AVMS) IS RELATED TO HIGH FLOW IN DEEP VENOUS STRUCTURES

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BACKGROUND
Intracranial hemorrhage is a serious complication in AVM patients. Prediction of the hemorrhage risk might support the decision for interventional therapy. Several morphologic risk factors have been described. We hypothesized that there are hemodynamic differences between patients with and without such risk factors.
METHODS
An MRI study was conducted in 46 consecutive patients (23 male, 23 female, 13–61 years) with AVM confirmed by conventional DSA. A patient was assigned to be "high-risk" if any of the following characteristics was present: haemorrhagic presentation, exclusive deep venous drainage and deep location of the AVM nidus. Signal-intensity curves of a contrast bolus passing through intracranial arterial and venous blood vessels were obtained with dynamic TREAT sequence. These curves were parameterized (TTP, maximum slope and a calculated model) and used as estimates of flow velocity with a dedicated software tool kit. Ratios of ipsi- and contralateral flow parameters were determined in 10 predefined arterial and venous vessel locations. These parameters were compared between the "high-risk" and non "high-risk" group.
RESULTS
Significantly higher ratios were found for the internal cerebral vein (1.14 +/-0.23 vs. 1.01 +/-0.31, p=0.015) and transverse sinus (1.03+/-0.19 vs. 0.94+/-0.14, p=0.037) in patients with high risk AVMs.
Other deep and superficial venous vessels did not show significant differences. Also, in none of the arterial vessels there was a significant difference in flow ratios between the two groups.
DISCUSSION
Our data suggest a high flow in the draining deep venous system ipsilateral to the feeders in the patient group considered to be at a high risk. No such difference was found in feeding arteries. These findings are in line with the hypothesis that the deep venous system rather than arterial feeders play a crucial role in the pathophysiology of AVM related haemorrhage and are congruent with the predominantly venous site of AVM rupture.

B6:6:6

TERRITORIAL AND MICROVASCULAR PERFUSION - THE TWO LEVELS OF PERFUSION IMPAIRMENT IN BRAIN ARTERIOVENOUS MALFORMATIONS

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PURPOSE
This study aims to analyse perfusion in the immediate vicinity and the adjacent vascular territories of brain arteriovenous malformations (AVMs) in a single measurement.
METHODS
Twenty consecutive AVM patients (7 female, 13 male) with a median age of 37 years were investigated by MR at 3 Telsa using 3 dimensional time-resolved MRA to determine inflow time points. Cerebral perfusion estimates were made using an arterial spin labelling technique and regional parenchymal determined in manually delineated vascular territories, in concentric shells around the nidus and for symmetric regions of interest in ipsilateral and contralateral hemisheres.
RESULTS
There was a negative correlation of the ratio of hemisheric territorial perfusion with the right/left inflow time ratio in a combined analysis of all affected vascular territories (R=−0.402, p=0.015). Five patients (25%) revealed a pronounced decrease of cerebral blood flow of >20% around the nidus which we termed a perinidal dip and 17 patients (85%) showed perivascular flow impairment on visual inspection of image data. There was no significant association of clinical symptoms with AVM volume, transit time or the presence of a perinidal dip. The degree of perfusion impairment correlated with the macrovascular discharge flow-through in AVMs.
DISCUSSION
The perfusion impairment in vascular territories next to a brain AVM with additional perinidal dip may reflect the existence of two levels of perfusion impairment: a territorial and a microvascular perfusion disturbance. While the hemispheric asymmetry in territorial perfusion seems the result of arterio-arterial re-distribution on a macrovascular level, a perivascular perfusion dip is inhomogeneously distributed within a single vascular territory and thus might result from low perfusion pressure in small arteries and arterioles.

Sunday - September 21, 2008 - Lecture Hall 'A'

A8
09.30–10.40 - Cerebrovascular Disease IV

A8:8:1

UTILIZING THE NOVEL "DYNAMIC HISTOGRAM ANALYSIS" WITH PERFUSION-WEIGHTED MRI IN ACUTE ISCHEMIC STROKE: CHARACTERISTICS OF PENUMBRA VERSUS INFARCT

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PURPOSE
Measuring perfusion characteristics, dynamics and heterogeneity in the infarct core, ischemic penumbra and healthy brain utilizing the "Dynamic Histogram Analysis" (DHA) can be a further step to predict outcome of ischemic parenchyma.
DHA dynamically analyzes pixel intensity distributions (histograms) of user-defined regions-of-interest (infarct/penumbra/normal parenchyma) during bolus passage in the "difference images" of the dynamic susceptibility contrast-enhanced (DSCE) Perfusion-MRI.
It is based on the raw perfusion images and does not apply deconvolution techniques.
METHODS
We prospectively analysed patients with anterior circulation ischemic stroke, who were scanned <6 hours after onset of symptoms using our stroke-MRI-protocol and showed presence of ischemic penumbra (defined as the area of diffusion-perfusion mismatch). The DHA method was applied on DSCE-difference images. For each difference image of the time series, pixel-intensity histograms of different ROIs were computed and fitted using the Levenberg-Marquardt algorithm. Histogram center-, width- and width-versus-position parameters were computed as a function of time during bolus-passage.
RESULTS
Twenty-five cases met the inclusion criteria. The histogram-center parameter was most sensitive to discriminate infarct core, penumbra and normal tissue. Best discrimination of the penumbra was observed during the recirculation phase, while that of the infarct core was obtained during the outflow phase. The width parameter reflected perfusion heterogeneity, which was higher in the penumbra than in the infarct core.
CONCLUSIONS
"Dynamic Histogram Analysis" is a novel, histogram-based, robust, reproducible method which allows assessment of the perfusion dynamics and heterogeneity in the ischemic penumbra versus infarct core. It allows a "dynamic" analysis of histograms in contrast to the recently proposed "static" histograms in Perfusion-MRI and is based on the raw perfusion data.

A8:8:2

CEREBROVASCULAR RESERVE EVALUATION ON MRI FOR INTRACRANIAL ARTERIES STENOSIS. FAISIBILITY AND INTEREST

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Endovascular treatment is efficient and diminish the stroke recurrences but carries a significant periprocedural morbidity and mortality risk. Defining a group of patients at higher risk is relevant when determining the benefit of an interventional approach. Among the four mechanisms of ischemic stroke secondary to intracranial atherosclerosis the most important is hypoperfusion due to an hemodynamic stenosis. Perfusion imaging with acetazolamide test is used to evaluate the cerebrovascular reserve
PURPOSE
To evaluate the faisability and interest of cerebrovascular reserve study on MRI
PATIENT AND METHOD
15 patients with a symptomatic intracranial artery stenosis over 50%
Perfusion MRI with gadolinium and continuous arterial spin labelling (CASL) before and after acetazolamide
Comparison of parametric maps of cerebral blood volume, blood flow and mean transit time before and after acetazolamide
Comparison of parametric maps of cerebral blood flow with CASL before and after acetazolamide and between the two perfusion MRI techniques
RESULTS
Cerebrovascular reserve study was always feasible and parametrics maps always usable
17 MRI were performed and 4 patterns were observed
Patients without significant asymmetry (less than 20%) before and after acetazolamide: 2 patients with 50% stenosis
Patients with an asymmetry but with a normalization after acetazolamide: 1 patient with a less than 60% stenosis.
Patients with a stable asymmetry after acetazolamide: 4 patients with a 50–70% stenosis
Patients with an increased asymmetry after acetazolamide: 7 patients with a stenosis over 80%.
CASL blood flow maps were close to those obtained with gadolinium, easier to obtain and more reproducible with an absolute calculation of regional blood flow
CONCLUSIONS
Evaluation of cerebrovascular reserve with MRI is simple and feasible. Results may be useful to select patients with hemodynamic stenosis. CASL is more simple and easier to use and should be used for intra cranial stenosis evaluation before angioplasty and stenting

A8:8:3

PREOPERATIVE VISUALISATION OF NEUROVASCULAR ANATOMY IN PATIENTS WITH NEUROVASCULAR COMPRESSION SYNDROME: A COMPARISON BETWEEN 1.5T AND 3T MRI

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PURPOSE
To compare the quality of high resolution MR imaging using 3T and 1.5T in patients with neurovascular compression (NVC) syndrome.
METHODS
14 patients with typical NVC syndrome (11 trigeminal neuralgias, 1 glossopharyngeal neuralgia, 2 hemifacial spasms) were examined on a 1.5T (Siemens, Sonata) and 3T (Siemens Tim Trio), respectively. High resolution 3D constructive interference steady state (CISS) and Time of Flight MR angiography (TOF-MRA) were analyzed qualitatively and quantitatively. Imaging parameters and acquisition times were almost identical between the two field strengths. Qualitative assessment for anatomic structures and artefacts was

performed on a 4-point scale (1=nondiagnostic, 4=excellent). For quantitative assessment SNR and CNR were calculated. Statistical analysis was based on the Wilcoxon signed rank test.
RESULTS
Overall image quality of CISS and TOF-MRA was significantly higher at 3T compared to 1.5T ($p<0.004$). NVC was diagnosed at both field strengths. Visibility of NVC, trigeminal branches, SCA and PICA was significantly higher at 3T ($p=0.002–0.014$) in the CISS-sequence. In the TOF-MRA all assessed vessels were rated higher at 3T ($p<0.034$). Delineation of the cavernous sinus, SNR and CNR were significantly higher at 3T ($p<0.02$) in both sequences.
CONCLUSIONS
The significantly higher SNR and CNR of the CISS and TOF-MRA at 3T provided images of higher resolution at the same acquisition time than at 1.5T, yielding significantly better visualization of anatomic structures and higher image quality. Although NVC was diagnosed at both field strengths, high field CISS and TOF-MRA provide better assessment of anatomic structures and enhances diagnostic accuracy.

A8:8:4

IMPROVED CORTICAL REPERFUSION PROTECTS COAGULATION FACTOR XII-DEFICIENT MICE FROM CEREBRAL INFARCTION AS REVEALED BY MULTIMODAL HIGH-FIELD MRI AT 17.6T

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PURPOSE
Transgenic deficiency of coagulation factor XII (FXII−/−) or pharmacological targeting strongly protects from experimental cerebral infarction, and importantly, is not associated with an elevated risk of hemorrhage, as recently shown by our group. By multimodal high-field-MRI at 17.6T the underlying stroke-protective mechanisms were elucidated.
METHODS
Transient (60 min) middle-cerebral-artery-occlusion (tMCAO) was performed in FXII−/−mice (n=10) and wildtype-controls (Wt, n=10). Permanent-MCAO was performed in three FXII−/−mice and three Wt underwent sham-operation. Animals were examined at 2 h and 24 h after the experimental procedure. Cerebral blood flow (CBF) was measured by continuous-arterial-spin-labeling, diffusion-weighted-imaging (DWI) and T2-relaxometry were applied. CBF-maps were evaluated by voxel-wise permutation-analysis after motion correction and normalization to a standard template. The probability of infarction was determined from DWI and segmented T2-maps.
RESULTS
At 2 h after tMCAO, CBF decrease was similar in FXII−/− and Wt-mice extending ipsilaterally over Cortex (CBF (ml/100 g/min) 33.6±6.9 vs. 35.3±4.6, $p=0.42$) and Subcortex (25.7±4.5 vs. 31.6±4.0, $p=0.17$). At 24 h substantial recovery ($p=0.02$, $F(1,18)=6.24$) of cortical CBF of + 36% was observed in FXII−/−mice contrasting a further decrease of −48% in tMCAO-Wt and of −75% in FXII−/− mice that underwent permanent-MCAO. Cortical reperfusion in FXII−/− mice related to a lower risk of infarction as compared to Wt after tMCAO(59% vs. 93%, $p=0.04$). Subcortical CBF was similarly decreased in both groups ($p=0.01$, $F(1,18)=9.45$) associated with similar isks of infarction (89% vs. 99%, $p=0.17$)
CONCLUSIONS
Reperfusion in the neocortex salvaging cortical neurons was identified as the stroke protective mechanism in FXII−/−. This finding is a strong indicator of favourable thrombus instability in the cerebral microvasculature in FXII−/−. Because targeting FXII was not associated with an increased risk of hemorrhage, it is a promising strategy for the prevention of arterial thrombosis in any condition associated with an elevated risk of arterial thrombosis: endovascular procedures and especially in-stent stenosis; cardiac surgery and invasive cerebral angiography.

A8:8:5

BLOCKADE OF THE GLYCOPROTEIN IB RECEPTOR SECURES MICROSVASCULAR PATENCY AND PROTECTS MICE FROM EXPERIMENTAL CEREBRAL INFARCTION AS REVEALED BY MULTIMODAL HIGH-FIELD MRI AT 17.6T

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PURPOSE
Early interference with platelet-aggregation by blocking the binding of von-Willebrand-factor to the Glycoprotein-Ib (Gp1b) receptor strongly protects mice from experimental cerebral infarction, and importantly, is not associated with an increased risk of hemorrhage, as recently shown by our group. By multimodal high-field MRI at 17.6T, we now elucidated the underlying mechanisms of stroke protection.
METHODS
Transient (60 min) middle-cerebral-artery-occlusion (tMCAO) was performed in mice treated by i.v. anti-Gp1bá-Fab-Fragments (anti-Gp1b, n=8) 1h before the experimental procedure and wiltype controls (Wt, n=10). Animals were examined at 2 h and 24 h after the experimental procedure. Cerebral-blood-flow (CBF) was measured by continuous-arterial-spin-labeling, and diffusion-weighted-imaging (DWI) and T2-relaxometry were applied. CBF-maps were evaluated by voxel-wise permutation-analysis after motion correc-

tion and normalization to a standard-template. The evolution and probability of infarction were determined from DWI and segmented T2 maps.
RESULTS
Initially after tMCAO at 2 h, deep gray matter CBF decrease was as severe (p=0.4) in anti-Gp1b (36.3±5.8 ml/100 g/min) as in Wt controls (32.4±9.0). However, initial cortical CBF decrease was less severe (p=0.07) in anti-Gp1b (72.±8.0) than in Wt controls (49.9±8.9). At 24 h after tMCAO, no significant reperfusion in deep gray matter was observed for any group (anti-Gp1b 32.5±7.6 vs. 23.7±7.0), cortical CBF remained stable in anti-Gp1b (70.1± 10.5) and Wt (44.5±6.1). Improved initial CBF related to a lower risk of cerebral infarction for anti-Gp1b in cortical (0.2 vs. 0.6) brain regions as compared to Wt.
CONCLUSIONS
Anti-Gp1b improves initial cortical CBF salvaging the neocortex from infarction meaning that at no time point the cortical microvasculature is critically threatened by thrombotic occlusion. Because anti-Gp1b was evenly effective when administered after the ischemic period and was not associated with an increased risk of hemorrhage it is promising not only for the prevention of arterial thrombosis during and after endovascular procedures, cardiac surgery and cerebral angiography but importantly, also for the acute treatment of ischemic stroke.

A8:8:6

SARA - A TELERADIOLOGY NETWORK FOR INTERDISCIPLINARY STROKE TREATMENT SUPPORT

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PURPOSE
To improve the treatment of stroke in the south west of Bavaria/ Germany - a region with more than 1.800.000 inhabitants - SARA (Schlaganfall-Initiative Region Augsburg- Schwaben) was set up.
METHODS
SARA is a teleradiology project combined with the expertise of neuroradiologists and neurologists. Klinikum Augsburg the center of expertise is a university teaching hospital with 1.600 beds and a stroke unit. Since 1999 a team of neurologists and neuro-radiologists teaches the medical stuff of the surrounding hospitals stroke pathophysiology, clinical symptoms, diagnostic tools including CT and therapeutic options. To improve the knowledge a curriculum is installed and takes place twice a year. Guidelines and instruments of quality management are elementary for SARA.
RESULTS
With the rising number of installations of CT scanners in the peripheral hospitals and out-patient units a good diagnostic covering is reached in the most parts of the country. All those CT-scanners are connected by teleradiology to the Klinikum Augsburg. With an interdisciplinary stroke team what is present 24 hours a day, the diagnostic and treatment of the patients is significantly approved.
CONCLUSIONS
A team of experts and teleradiology is the key to improve stroke treatment countrywide, but a continuous training of the medical stuff is indispensable. So the state of the art therapy is no more a privilege of university teaching or equivalent hospitals.

A8:8:7

CEREBRAL DIFFUSION AND PERFUSION MRI AS PROGNOSTIC TOOLS IN COMATOSE PATIENTS TREATED WITH HYPOTHERMIA - A PROSPECTIVE OBSERVATIONAL STUDY

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BACKGROUND
Prognosis after cardiac arrest is poor. Survival rates to hospital discharge for in hospital cardiac arrest (IHCA), is approximately 20%. Induced hypothermia (32–34°C during 12–24 h) may significantly improve the neurological outcome and mortality in patients with primary cardiac arrest who remain comatose after return of spontaneous circulation. Previously, magnetic resonance imaging (MRI) has only been performed on comatose survivors of cardiac resuscitation without induced hypothermia.
AIM
To evaluate diffusion and perfusion MRI of the brain as prognostic tools for survival and neurological outcome after cardiac arrest in patients treated with mild hypothermia.
METHODS: This prospective, observational study of cardiac arrest patients treated with mild hypothermia (32–34°C during 24 h) comprised 20 patients who all remained unconscious after normalized body temperature. Diffusion and perfusion MRI of the entire brain was performed approximately 5 days after cardiac arrest. Autopsy was performed on two patients.
RESULTS
The largest number of diffusion changes on MRI was found in the 16 patients who did not survive despite intensive care. The parietal lobe showed the largest difference in number of acute ischemic lesions in deceased compared with surviving patients. Perfusion changes (> ±2SD compared with a normal material) were found in seven out of eight patients. Neuropathologic examination revealed lesions corresponding to the alterations seen on MRI.
CONCLUSIONS
Diffusion and perfusion MRI are potentially helpful tools for evaluation of prognosis and for treatment decisions in comatose patients treated with hypothermia after cardiac arrest.

A9
10.45–11.55 - Degenerative diseases of the Brain II

A9:9:1

SURVEY OF IMAGING IN THE INVESTIGATION OF DEMENTIA IN THE UNITED KINGDOM

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INTRODUCTION
Dementia is characterised by symptoms such as memory decline, loss of reasoning, and communication skills which are caused by chemical and structural changes in the brain. A recent study estimates that by 2025 there will be 1 million cases of dementia with a current cost implication of 17 billion per year in the UK.
Imaging plays a crucial role in the diagnosis of dementia but carries a significant cost implication. The National Institute of Clinical Excellence (NICE) recommends MRI for structural imaging with CT, SPECT and PET as alternatives. The aim of this survey was to investigate the current practice of General and Neuroradiology departments in the UK with regards to Dementia imaging.
METHODS
A standard questionnaire was sent to 30 Neuroradiology and 45 General Radiology centres in the UK to asses the current opinion and protocols for dementia imaging. Replies were encouraged by either post or e-mail. The replies were anonymously entered into a Microsoft Access database.
RESULTS
Analysis was restricted to 27 replies from the Neuroradiology centres as there were only 5 replies from the General Radiology centres.
We found that, Only 30% had a departmental policy for Dementia.
Though 89% were aware of the NICE guidelines only 63% adhered to and 56% agreed with them. Resources were the limiting factor in 42% of those who disagreed with NICE.
Approximately only half the centres had resources for Dementia imaging.
Only 48% believed that imaging in minimal cognitive impairment had any value Age played an important role in imaging strategy in 56% of the centres.
CONCLUSIONS
From the survey we can infer that the priority of dementia is quite low among General radiology departments. Though there is a greater awareness among the Neuroradiology departments, lack of resources and together with possibly a negative view of aging appear to be the limiting factors for a more effective imaging service.

A9:9:2

CORRELATION OF PERFUSION CT AND CT VOLUMETRY IN PATIENTS WITH ALZHEIMER'S DISEASE

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PURPOSE
The aim of the study was to find correlation between the results of brain perfusion CT (pCT) and CT volumetry in patients with Alzheimer's disease (AD).
METHODS
Forty eight patients with AD (mean age 71.3 years) underwent brain pCT and CT volumetry. pCT was performed at the level of basal ganglia after the injection of contrast medium (50 ml, rate 4 ml/sec.) and serial scanning (delay 7 sec, 50 scans, 1scan/sec). Volumetric measurements were assessed from the source images using dedicated CT software combined with the manual outlining of the regions of interest including extracerebral and intraventricular cerebrospinal fluid (CSF) spaces. The results of perfusion parameters of cerebral blood flow (CBF) and volume (CBV) from the regions of grey matter in the frontal and temporal lobes as well as basal ganglia were compared statistically with the volumetric measurements of frontal and temporal cortical atrophy as well as subcortical atrophy, respectively.
RESULTS
The comparison of CBF and CBV results with the volumetric measures in the areas of the frontal and temporal lobes showed mostly negative correlations (the greater amount of extracerebral CSF, the lower CBF and CBV), but none of them was of statistical significance. Statistically significant positive correlation (the greater amount of intraventricular CSF, the greater CBF and CBV) was found between the values of CBF and CBV in the basal ganglia and the volumes of the lateral and third ventricles.
CONCLUSIONS
In patients with AD the degree of cortical atrophy is not correlated with pCT of grey matter and the rate of subcortical atrophy with the decrease of perfusion in the basal ganglia region. It suggests that functional and structural changes in AD are not related to each other.

A9:9:3

THE COMPARISON OF VOLUMETRIC AND COMPUTER INTERACTIVE FRACTAL METHODS BASED ON CT STUDIES IN EVALUATION OF CORTICAL AND SUBCORTICAL ATROPHY OF THE BRAIN IN PATIENTS WITH DEMENTIA

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BACKGROUND AND PURPOSE
Brain atrophy is one of the most important imaging findings in patients with dementia. However visual assessment of atrophy lacks the precision and traditional volumetric methods are very time consuming. The aim of our study was to compare the results of the quantitative measurements of brain atrophy, including newly developed computer interactive method in patients with dementive disorders.

METHODS
Cortical and subcortical brain atrophy in 68 patients with clinical and neuropsychological diagnosis of dementia (42 with Alzheimer disease, 12 with vascular dementia and 14 with mixed dementia) were evaluated using visual assessment by radiologist, semiautomatic volumetric method and fully automatic fractal method on the base of CT examinations.
The visual evaluation was done by an experienced radiologist and rated in 0–3 scale. The semiautomatic method was performed on the Advantage Workstation using commercial software with manual correction of the radiologist. The automatic method was based on fractal segmentation of CT images developed by the authors and on evaluation of fractal dimension. The results of all three methods were compared statistically using Pearson's test.
RESULTS
There was significant correlation between all three methods of measurements of both cortical and subcortical atrophy. On the level of significance of 0,05 Pearson coefficients were between 0,777 and 0,838 which is compatible with strong correlation. The correlation was slightly higher in cortical than in subcortical atrophy. The automatic method was much quicker than semiautomatic one, which required up to 2 hours.
CONCLUSIONS
The automatic fractal method which is quick and easy to use can replace the time consuming, volumetric method in evaluation of brain atrophy in patients with dementia.

A9:9:4

CURRENT ROLE OF BRAIN CT AND SPECT IN PREDICTION OF DETERIORATION IN PATIENT PRESENTED MILD COGNITIVE IMPAIRMENT (MCI)

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BACKGROUND
Mild cognitive impairment and dementia are a conditions referring to the persons with significant memory deficiency, often accompanied by the functional lost in attention, language, visuospatial and psychomotor function, in further development could be switched to dementia. Particular those individuals with a MCI have an increased risk of developing dementia, and it becomes important to identify the clinical and neuroimaging measures that ultimately will predict a subsequent decline.
The aim of the study was to evaluate the differences between MCI subjects who did or did not develop progression and converted to dementia, based on standard neuroimaging approach, which consist with anatomical and functional imaging.
METHODS
MCI (n=105) individuals enrolled in a long term study with median follow-up >32 months. All patients received annual clinical and psychometric examinations at the Alzheimer's Day Clinic in Warsaw. All patients received a head imaging study: temporal lobe oriented computed tomography (CT) and single photon emission computed tomographic scan (SPECT). The diagnosis of MCI according to Mayo Clinic Petersen's Criteria was conducted by a panel of specialists, and the session of neuropsychological testing were completed on all subjects.
RESULTS
After three years of follow-up 42 subjects remained the same or improved (eight), and 63 had progressive cognitive impairment, including 23 who converted to dementia. At the baseline two prognostic groups differed significantly in regard to the degree of atrophy of the temporal lobe on CT scan and temporal and/or parietal reduction of brain perfusion SPECT.
CONCLUSIONS
We conclude that linear measurements of atrophy in CT and semi-quantitative analysis of brain perfusion SPECT may constitute a predictor for those who are more likely to deteriorate.

A9:9:5

THE COMPARISON OF CORPUS CALLOSUM AREA AND BRAIN VOLUME AMONG ALZHEIMER'S DISEASE, MILD COGNITIVE IMPAIRMENT AND HEALTHY CONTROL

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OBJECTIVE
We wanted to compare the corpus callosum (CC) area and brain volume among AD, MCI and healthy controls (HC) and to evaluate the relationship between the CC area and brain volume.
MATERIALS AND METHODS
The 11 AD patients (M:F=3:8, mean age 75.7 years), 17 MCI patients (M:F=8:9, mean age 60.9 years), and 28 HC (M:F=11:17, mean age 66.4 years) were investigated for comparison the CC area and brain volume. To evaluate the relationship of the CC area and brain volume, the 111 HC (M:F=48:63, mean age 56.9 years) without memory disturbance and 38 patients with memory disturbance were evaluated. The brain volume was estimated in forebrain subtracting cerebellum and CSF space. The CC area was measured by regions of interest placed on outer margin of CC in midsagittal slice.
RESULTS
There was good positive linear correlation between the CC area and brain volume ($r=0.66$, $P<0.01$). The CC area and brain volume in AD patients(489.1 ± 72 cm^3, 715.4 ± 107 mm^2) was significantly smaller than MCI patients (595.9 ± 108 cm^3, 844.1 ± 85 mm^2) ($P<0.05$) and HC (563.2 ± 75 m^3,818.9 ± 109 mm^2) ($P<0.05$). There was no statistical significance in comparison of the CC area and brain volume between MCI patients and HC.
CONCLUSIONS
The CC area as well as brain volume was significantly smaller in AD than MCI and healthy control. The CC area is significantly correlated

with the brain volume. The CC area would be useful in evaluation of patients with memory impairment.

A9:9:6

ANALYSIS OF THE BRAIN WATER SIGNAL DECAY IN MR DIFFUSION-WEIGHTED IMAGING IN PATIENTS WITH LIVER CIRRHOSIS

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PURPOSE
The aim of this study was to clarify the possible role of compartmentalization in water signal decay in DW images of normal appearing white matter via biexponential analysis in a cohort of patients with liver cirrhosis.
PATIENTS AND METHODS
The experiments were designed to examine water diffusion in the brain of cirrhotic patients over an extended range of b-values (11 b-values; range 0–7500 s/mm2), and to explore biexponential signal decay changes in patients versus healthy controls. DW-based measures included mean diffusivity (MD), fractional anisotropy (FA) and amplitudes of slow- and fast diffusion components (fslow and ffast). Measures were obtained from regions of interest selected within the supratentorial corticospinal tract (CST) and from the lateral ventricles.
The experiments were carried out in 44 cirrhotic patients without overt hepatic encephalopathy and 20 aged-matched healthy controls.
RESULTS
Compared to controls, patients presented a significant increase in MD values within the CST for both fast (0.001189±0.000041 mm2/s vs. 0.001249±0.000066 mm2/s, $P<0.001$) and slow components (0.000141±0.000008 mm2/s vs. 0.000157±0.000027 mm2/s, $P<0.001$). FA significantly decreased only for the fast component (0.54±0.04 vs. 0.50±0.05, $P<0.006$). Absolute amplitudes increased for the fast (65.7±4.0 vs. 74.4±13.0, $P=0.001$) and slow components (32.7±2.8 vs. 36.4±3.1, $P<0.001$). Relative amplitudes did not show significant differences (66.7±1.5 vs. 66.8±2.7 and 33.3±1.5 vs. 33.2±2.7).
These results indicate an increase in both components, and therefore support the concept of a net increase in brain water content in cirrhotic patients. The changes observed are the opposite of what has been observed in models of cytotoxic and vasogenic edema,
CONCLUSIONS
Measurement of biexponential decay with high diffusion weighting is feasible in the clinical scenario. The data obtained suggest the presence of a mixed pattern of brain edema in cirrhotic patients.

A9:9:7

BRAIN INVOLVEMENT IN MYOTONIC DYSTROPHY TYPE 1 (DM1) AND TYPE 2 (DM2): MAGNETIC RESONANCE IMAGING (MRI), CLINICAL AND COGNITIVE PROFILE

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OBJECTIVE
to characterize brain MRI in DM1 and DM2 and to compare the degree of cerebral abnormalities with genotype, clinical and cognitive phenotype.
METHODS
we evaluated 46 DM1 (mean age 39.8±15.9 years; 29 males) and 12 DM2 (mean age 52.7±14.8 years 5 males), all molecularly determined (CTG triplet expansion quantified in DM1). Age of disease onset, disease duration, educational level were recorded. Neuromuscular assessment was done by muscular impairment rating scale (MIRS). An extensive neuropsychological battery was performed. All brain MRI were performed with a Marconi-Picker 1.0T scanner; T1, T2, FLAIR and DWI axial and coronal images were acquired. White matter hyperintense lesions (WMHLs) were classified by ARWMC-score.
RESULTS
in 37/46 (80,5%) DM1 and in 10/12 (83%) DM2 MRI showed scattered supratentorial, symmetrical, focal or diffuse WMHLs. In 10 and 18 DM1 patients, MRI showed insular or temporo-insular subcortical bilateral involvement respectively; one patient presented isolated temporal involvement; this pattern did not correlate with cognitive involvement. In this cohort frontal WMHLs burden correlated with CTG expansion size ($p<0.05$); global WMHLs burden correlated with major cognitive involvement ($p<0.05$). DM2 patients presented a lesser extent of WMHL ($p<0.01$). No correlation between MIRS and WMHLs burden was found in both our cohorts.
CONCLUSIONS
DM1 patients present a more severe brain involvement than DM2; the temporo-insular diffuse WMHLs pattern, though very specific for DM1, has less clinical impact. A greater CTG-expansion is confirmed as risk factor for more extensive brain involvement in DM1.

Lecture Hall 'B'

B8
10.45–11.55 - Interventional Neuroradiology: Brain IV

B8:8:1

PACKING DENSITIES USING BALLOON REMODELING TECHNIQUES AND RATE OF ANEURYSM OCCLUSION

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PURPOSE
Newer generation embolization coils (Presidio-18, Presidio-10 and Cashmere-14, Micrus Endovascular, San Jose, CA) and navigable, hyper-compliant balloons (Hyperform, Hyperglide, eV3, Irvine, CA) have functioned to optimize the packing densities which can be achieved during neuroendovascular aneurysm embolization. We evaluated our database to assess the packing densities which could be achieved using these newer coils in concert with a balloon remodeling technique.
METHODS AND RESULTS
From January 2007 to present, 92 previously untreated aneurysms (50 ruptured, 42 unruptured) underwent balloon-assisted embolization. Of these, twenty four underwent endovascular coiling with balloon remodeling using these newer generation Micrus coils. Eight patients presented with SAH while sixteen were incidental. All aneurysm volumes and packing densities were calculated using AngioCalc (www.angiocalc.com). The overall complete occlusion rate was 50%. Mean aneurysm was 146.87 mm3(mean diameter 6.5 mm) with no statistical difference between ruptured vs unruptured aneurysms or complete vs incomplete occlusions. The mean aneurysm packing density was 44.5%, with no significant difference related to aneurysm occlusion rates or rupture status. Twelve patients underwent MR imaging post coiling, with six patients having evidence of diffusion positive hyperintensities, none of which were clinically symptomatic.
DISCUSSION
The balloon remodeling used in conjunction with newer generation coil technology have allowed for mean packing densities of 44.5%, much higher than what has been reported in previous case series.
CONCLUSIONS
Balloon remodeling is a safe technique for the coil embolization of both the ruptured and unruptured aneurysms, with a complete occlusion rate of 50%. When combined with newer generation coil technology, packing densities over 35% can be routinely achieved.

B8:8:2

BALLOON REMODELING AND HYDROGEL-COATED COILS: PACKING DENSITIES AND OCCLUSION RATES

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PURPOSE
We hypothesize that Hydrogel coated coils (Microvention, Aliso Viejo, CA) and navigable, hyper-compliant balloons (Hyperform/ Hyperglide, eV3, Irvine, CA) have functioned to optimize packing densities which can be achieved during aneurysm embolization. We evaluated our database to assess the rate of complete occlusion using these devices in concert during embolization.
METHODS
From January 2007 to present, 92 previously untreated aneurysms (50 ruptured, 42 unruptured) underwent balloon-assisted embolization, of which 65 were treated with at least one hydrogel coil, and 27 were treated no hydrogel coils. All aneurysm volumes and packing densities were calculated using AngioCalc (www.angiocalc.com).
RESULTS
The average aneurysm volume was 177.12 mm3. Nine patients did not survive initial SAH despite treatment. Of the 83 remaining patients, complete occlusion was achieved in 50 of 83 patients (60.2%). Patients whose coiling achieved ¡Ý30% packing density and included either (¡Ý1) hydrogel coil (Hydrocoil or Hydrosoft) or (¡Ý1) Hydrosoft coil were more likely to achieve complete occlusion than those aneurysms which did not contain any hydrogel (Chi Square, 77%vs23% $p<0.04$ and 72%vs28% $p=0.04$, respectively). There was no difference in packing density or aneurysm volume in those treated with at least one Hydrosoft coil, regardless of occlusion outcome. Completely occluded aneurysms treated with at least one Hydrocoil, were of smaller volume (122 mm3 vs 723 mm3, $p=0.043$) and greater packing densities (86.3%vs45.4%, $p=0.044$) than incompletely occluded aneurysms.
There were 24 aneurysms whose coil regimen did not include Hydrogel. Of those patients, there was no statistically significant relationship between aneurysm volume (134 mm3 vs 160 mm3, $p=0.8$) or packing densities (42.2% vs 46.9%, $p=0.5$) between complete occluded ($n=12$) and incompletely occluded aneurysms ($n=12$).
CONCLUSIONS
Aneurysms treated with at least one hydrogel-coated coil with packing density of at least 30% were more likely to completely occlude compared to aneurysms treated without hydrogel-coated coils when using a balloon remodeling technique.

B8:8:3

IS BALLOON-ASSISTED COIL EMBOLIZATION OF UNRUPTURED ANEURYSMS DANGEROUS? ANALYSIS IN ATENA SERIES

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PURPOSE
Endovascular treatment using coils is increasingly used in the management of intracranial aneurysms, but can be technically difficult when the neck is wide. In this case, the remodelling technique can be used, but its safety is still a matter of controversies. Our goal was to analyze precisely the results of the remodelling technique in a large,

prospective, multicentric series dealing with endovascular treatment of unruptured intracranial aneurysms (ATENA).
METHODS
Analysis was conducted in the subgroup of patients included in ATENA series, selectively treated by coiling alone or remodelling. 588 patients (416 females and 172 males; age: 22–83 years, mean: 51.0±11.1 years) harbouring 666 aneurysms were treated during 624 procedures. Aneurysms were treated by coiling alone in 395 cases and by the remodelling technique in 271 aneurysms.
RESULTS
The global rate of complications was 10.4% for coiling, and 11.4% for remodelling. Thromboembolic events, intraoperative rupture, and device related problems were respectively encountered in 6.3%, 2.0%, and 2.0% treated by coiling, and 5.2%, 3.3%, and 2.9% treated by remodelling technique.
Morbidity was 2.2% after coiling and 2.4% after remodelling. Mortality was 0.8% after coiling and 1.6% after remodelling.
CONCLUSIONS
The remodelling technique can be safely used in the treatment of unruptured intracranial aneurysms being associated with a similar rate (11.4%) of adverse events than coiling (10.4%), and a non significantly different morbimortality rate (coiling: 3.0%; remodelling: 3.9%).

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UNRUPTURED INTRACRANIAL ANEURYSMS TREATED BY ENDOVASCULAR APPROACH: RESULTS OF THE ATENA STUDY

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PURPOSE
The management of unruptured intracranial aneurysms remains controversial and the results of endovascular treatment are not precisely known since no prospective data exist. The first prospective, multicenter study (ATENA) was conducted in Canada and France to determine clinical outcome and risks of this treatment.
METHODS
649 patients harbouring a total of 1100 aneurysms were prospectively and consecutively treated by endovascular coil embolization in 27 Canadian and French neurointerventional centers. Of these, 739 unruptured intracranial aneurysms were treated during 700 procedures. Aneurysms were selectively treated in the great majority of cases (98.4%) with coils alone (54.5%), the balloon remodeling technique (37.3%) or stenting (7.8%).
RESULTS
Endovascular treatment failed in 32 aneurysms (4.3%). Technical adverse events with or without clinical modification were encountered in 15.4% of patients and included thromboembolic complications (7.1% per procedure), intraoperative rupture (2.6% per procedure) and device related problems (2.9% per procedure). The rate of thromboembolic complications and intraoperative rupture is significantly affected by aneurysm size. The one month morbidity and mortality rates were 1.7% and 1.4% respectively.
CONCLUSIONS
Endovascular treatment of unruptured intracranial aneurysms is feasible in a high percentage of cases with low morbidity and mortality rates.

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NEUCRYLATE, A NEW LIQUID EMBOLIC AGENT FOR ANEURYSM THERAPY. INITIAL CLINICAL RESULTS

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The next quantum change in the treatment of cerebral berry aneurysm is likely to be the development and clinical application of a liquid embolic agent.
Liquids have the desired property of conforming to irregular aneurysm shapes, and more importantly, can be contoured around a balloon interface at the neck. That smooth interface would then re-create normal nonturbulent blood flow dynamics past the area that was previously the aneurysm neck. Neucrylate, a new cyanoacrylate based liquid agent, appears to satisfy these requirements.
A50 year old male suffered significant subarachnoid hemorrhage, recovered, and 10 days later came for definitive treatment. At the time of admission, he was completely neurologically normal. Catheter cerebral angiography demonstrated a broad neck anterior communicating aneurysm that filled from both anterior cerebral arteries.
Two balloons were placed across the anterior communicating arteries into the contralateral A2 segments. A microcatheter was then guided into the mid portion of the aneurysm and Neucrylate was introduced using real-time fluoroscopic visualization control. Introduction and polymerization of the device took less than a minute.The microcatheter was then removed, the balloons were deflated, and a follow-up angiogram was performed. All cranial vessels filled normally.
The treatment was carried out under mild systemic heparinization (4000 units given as a single bolus at the beginning of the insertion of the balloon microcatheters), and with platelet inhibition (aspirin 325 mg and clopidogrel 75 mg daily for three days prior to his procedure.)
As animal and implant studies have been completed, this first clinical success may be the beginning a new treatment paradigm, a technique to give surgeons a more rapid and effective treatment for cerebral berry aneurysms, as not only does the liquid Neucrylate fill aneurysms of irregular shape, but it also presents a smooth surface the blood flowing past the prior aneurysm neck.

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SHORT TERM (14 MONTHS) EXPERIENCE WITH A NEW, DETACHABLE TIP MICROCATETER- THE SONIC. COMPLICATION, INDICATION, PROS AND CONS

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The Sonic is a new micro catheter with a detachable tip that was developed for Onyx Injection in Brain A.V.M.

It was lunch in the market in the last two year and is being used in more and more centers.
We started to use it early and till now it has been used by us for more than 120 times for different applications.
We us the Sonic micro-catheter for long injection of Onyx in BRAIN A.V.M's, through a feeder from V.B system, internal and external Carotid artery.
It was also used with Onyx for the of intracranial Dural A.V.F and for vascular tumors like G.B.M, Glomus Vagale and Jugulare.
We also used it for prolong injection of glue into a vascular lesion.
One of those was a Cardiac fistula between the Rt. Coronary artery and the Rt. Ventricle, where Neuro-intervention technique was utilized to assist the Cardiologist.
We occlude the fistula completely with no evidence of clinical complication.
According to our experience, Sonic opened an opportunity window to new options of treatment and higher successes rate.
It's important to recognize this new device -including the technique of its usage, technical difficulties and complications.
We would like to share with you our 14 months of experience with more than 120 micro-catheter in around 60 patients with high rate of lesion occlusion.

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RADIOLOGICAL FOLLOW-UP OF EMBOLIZED INTRACRANIAL ANEURYSM WITH DETACHABLE COILS. 160 CASES - OWN EXPERIENCE

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Embolization of intracranial aneurysms with detachable coils is generally used method of elimination them from cerebral circulation and protection from subarachnoid haemorrhage or rebleeding. It concern ruptured aneurysms and also never ruptured aneurysms. From 2004 to 2007 in Institute Psychiatry and Neurology 160 procedures of endovascular embolization was conducted. 55 ruptured aneurysms and 105 unruptured aneurysms or with possibility of rupture in the past was embolized. In 75 cases complete occlusion of the aneurysm and in 85 cases subtotal embolization was made. 60 patients had control cerebral angiography 3 or 6 months after embolization also 12 and 24 months after the procedure. In 32 cases completely elimination of the aneurysm from cerebral circulation was found. In 28 cases partial recanalization was found. In patients with recanalization of aneurysm, reembolization of remnant was conducted.
CONCLUSIONS
Control cerebral angiography and possible reembolization is a necessary procedure, as recurrence filling of the aneurysm with blood is a frequent phenomenon.

B8:8:8

INITIAL STUDY OF FUNCTIONAL AND ANGIOGRAPHIC RESULTS OF ENDOVASCULAR TREATMENT OF ARTERIOVENOUS-MALFORMATIONS USING HISTACRYL GLUE

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Authors presenting initial study concerning evaluation of outcome of treatment of supratentorial arteriovenous malformation using histacryl glue. Retrospective study enrolled group of patients treated during the period of 2000–2007 in Department of Neurosurgery in Warsaw. Prospective evaluation of treatment efficacy was done by performing postoperative angiography during follow up period. Functional outcome was evaluated using Glasgow Outcome Scale, modified Rankin Scale and Karnofsky performance scale and neuropsychological tests. Functional outcome results were correlated to the preembolization grading system of AVM by Spetzler and Martin.

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INITIAL COMPARATIVE STUDY OF TREATMENT OF ANTERIOR COMMUNICATING ANEURYSMS BY USING DIRECT CLIPPING OR ENDOVASCULAR ROUTE.

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Authors presents initial comparative study concerning evaluation of outcome of treatment of anterior communicating aneurysms by using direct clipping or endovascular route. Retrospective study enrolled two groups of patients treated during the period of 2000–2007 in Department of Neurosurgery in Warsaw. Prospective evaluation of treatment efficacy using clipping or coiling was done by performing postoperative angiography and angio-CT scans. Functional outcome was compared using Glasgow Outcome Scale, modified Rankin Scale and Karnofsky performance scale and neuropsychological tests.

B8:8:10

INTRACRANIAL BLEEDING DURING THE LATENCY PERIOD AFTER GAMMA KNIFE SURGERY FOR DURAL ARTERIOVENOUS SHUNTS COMPARISON TO THE NATURAL HISTORY

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PURPOSE

Radiosurgery for dural arteriovenous shunts (DAVS) is an alternative to endovascular treatment or open surgery. However, DAVS with cortical venous drainage (CVD) can cause intracranial hemorrhage during the latency period before the obliteration by radiosurgery takes place. CVD is therefore a relative contraindication to radiosurgery. The aim of this study was to appraise if the risk of bleeding after radiosurgery is related to the presenting event, i.e. hemorrhage.

MATERIALS AND METHODS

Material 1 comprised the natural history

The material consisted of 85 patients with 85 DAVS, all with CVD. 32/85 had presented with intracranial hemorrhage. All patients were followed until death or treatment, a total of 108 patient years (mean 1.3 years).

The annual incidence of hemorrhage and the impact of presentation with hemorrhage were calculated from material 1.

Material 2 comprised the treatment by Gamma Knife Surgery (GKS). 36 of the 85 patients were subjected to GKS. 22/36 had presented with bleeding.

All 36 patients had clinical follow up. 27 had control angiography. Four had MRI/CT. Four refused any radiological investigation. One was subjected to emergency surgery of the DAVS.

The outcome of GKS was compared to the natural course with regard to the risk of hemorrhage (Fisher's exact test).

RESULTS

Material 1

The annual incidence of hemorrhage from an untreated DAVS that presented with hemorrhage was 7.4%.

If presentation was other than hemorrhage the annual incidence was 1.5%.

Material 2

Two patients bled after GKS. Neither had presented with hemorrhage.

For those that had presented with hemorrhage GKS had a protective effect significant on the P=0.05 level.

GKS had no impact on the risk for hemorrhage significant on the P=0.05 level in the group that had not presented with hemorrhage.

CONCLUSIONS

Presentation with hemorrhage is a risk factor for bleeding in the untreated patient with a DAVS.

Radiosurgery had a significant (P=0.05) protective effect against hemorrhage in patients that has presented with intracranial bleeding. No such effect was shown for patients that had not presented with hemorrhage.